

An IUGS Event



# RFG 2018

RESOURCES FOR FUTURE GENERATIONS

PREMIER INTERNATIONAL CONFERENCE ON  
ENERGY · MINERALS · WATER · THE EARTH

**June 16-21, 2018**

Vancouver Convention Centre, BC, Canada

**RFG2018.ORG**

## PROGRAM



**#RFG2018**



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PRIME MINISTER • PREMIER MINISTRE

June 16–21, 2018

Dear Friends:

I am pleased to extend my warmest greetings to everyone attending the Resources for Future Generations 2018 conference.



This event brings nearly 3,000 delegates together to share their knowledge, perspectives and research on Energy, Minerals, and Water in the context of the Earth, Communities and Society, and Education and Youth. I am certain that everyone in attendance will benefit from the discussions and presentations planned for this conference, and will leave inspired to put what they have learned into practice.

I would like to commend the organizers for putting together a varied and informative program. I would also like to congratulate everyone in attendance for their commitment to protecting critical resources.

Please accept my best wishes for a productive convention in Vancouver.

Sincerely,

The Rt. Hon. Justin P.J. Trudeau, P.C., M.P.  
Prime Minister of Canada



## A MESSAGE FROM PREMIER JOHN HORGAN

As Premier of the Province of British Columbia, I am pleased to welcome everyone to the Resources for Future Generations (RFG2018) conference here in beautiful Vancouver.

This conference is a wonderful opportunity to consider the future global requirements for resources in the context of human needs, the environment and long term sustainability goals. The resource sectors play important roles for the the economy and employment in BC, and I'm pleased that this conference brings together multidisciplinary perspectives to address the challenges, opportunities and connections among energy, minerals and water.

Our government is committed to providing safe, affordable energy, and we want to ensure that utilizing our natural resources is done in a sustainable manner – both to preserve our environment and with the recognition that these resources will be needed by future generations. To that end, we are creating a roadmap for the future of BC energy that will drive innovation, expand energy-efficiency and conservation programs, generate new energy responsibly and sustainably, and create lasting good jobs across the province. Discussions taking place at RFG2018 will also aid us in hitting climate targets, maximizing related job opportunities, and protecting our province for generations to come.

I would like to thank the organizers of this conference for all of their hard work. Coordinating such a large, international conference like this takes a special set of skills, and I thank you all for your leadership.

I wish you all the best for a productive and invigorating conference.

HONOURABLE JOHN HORGAN  
PREMIER OF BRITISH COLUMBIA

**MESSAGE FROM**

**NATIONAL CHIEF PERRY BELLEGARDE  
ASSEMBLY OF FIRST NATIONS**

On behalf of the Assembly of First Nations, welcome Hereditary Chiefs, Chiefs, Elders, representatives from visiting nations, and to all participants and guests welcome to the Resources for Future Generations 2018 conference, taking place on the unceded territories of the Musqueam, Squamish and Tseil-Waututh First Nations.

Lands, water and natural resources are sacred to all First Nations, and the sustainability of these precious gifts from the Creator are key to a healthy environment, and the well-being of all living things. We welcome the opportunity to engage and share our knowledge and perspectives, which you will find are as rich and diverse as the lands themselves. We share a common goal of finding the best path forward for a sustainable future.

The world has become too dependent on fossil fuels. We have the opportunity now to become leaders in renewable energy. The Resources for Future Generations conference provides a great opportunity to work together, exchange ideas and overcome challenges in the spirit of partnership and reconciliation to achieve the kind of sustainability future generations need.

Kinanāskomitin

*Perry Bellegarde*

**Perry Bellegarde**  
National Chief









## WELCOME FROM THE GENERAL CHAIR

Welcome to Vancouver, Canada to the first international conference dedicated to the availability and delivery of resources to sustain future generations. Resources for Future Generations (RFG2018) will examine three critical resources - energy, minerals and water - in the context of the earth, environment, education, society, and the needs and roles of future generations. We will be together from June 16-21.

RFG2018 is taking place under the auspices of the International Union of Geological Sciences (IUGS), and being delivered by Canadian partners: the Canadian Federation of Earth Sciences (CFES), the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), the Geological Association of Canada (GAC), and the Mineralogical Association of Canada (MAC).

It is important to acknowledge that the event is being held on the ancestral, traditional and unceded Aboriginal territories of the Coast Salish Peoples, and in particular, the Squamish, Musqueam and Tsleil-Waututh First Nations.

Attendees represent earth science and engineering research and practice, industry, governments, Indigenous people and communities. We especially welcome early career professionals, researchers and students and have dedicated events for them, the Future Generation.

RFG2018 has six major themes: the **Earth, Energy, Minerals, Water, Resources and Society**, and **Education and Knowledge**. The Earth theme addresses the knowledge that underpins the future availability and responsible use of resources, and provides venues for a wide variety of sessions covering fundamental and applied earth science, topics of particular interest to members of IUGS, GAC and MAC. This theme links through sessions that will focus on the interplay between human ingenuity and new technologies in the context of a world that is changing dramatically and unpredictably, to numerous sessions covering societal themes related to governments, Indigenous people, communities, civil society in general, and education. The oral and poster sessions cover many areas of specific interest, and topics that should appeal to many participants.

Given the multi-sector, multi-disciplinary nature of the conference, the plenary and keynote program includes two to three sessions each day with topics that address the major opportunities and challenges related to the three key resource sectors. This suite of 45+ sessions provides opportunities for all participants to listen to speakers and panel members with international stature, and to participate in the ensuing discussion.

More than 85 sponsors, technical and supporting partners representing a wide variety of local and global interests are playing critical roles in the development of this novel conference.

Enjoy Vancouver! Surrounded by mountains and the Pacific Ocean, it is Canada's gateway to Asia and other Pacific nations. This city is renowned for being forward-looking, friendly, cosmopolitan, and entertaining. It is also an appropriate location for RFG2018, since the extraction and responsible management of energy, minerals, and water are integral to the success of British Columbia.

On behalf of the RFG2018 Steering Committee and all our partners, I am thrilled to welcome you to Vancouver.

Take part in the conversation!

A handwritten signature in black ink, appearing to read 'John F.H. Thompson', with a long horizontal line extending to the right.

**John F.H. Thompson**  
RFG2018 General Chair

## PARTNER ORGANIZATIONS

The International Union of Geological Sciences (IUGS), the Canadian Federation of Earth Sciences (CFES), the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), the Geological Association of Canada (GAC) and the Mineralogical Association of Canada (MAC) are partnering to bring together industry, academia, governments, and civil society for RFG2018.



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## COMMITTEES

Leaders of CIM, GAC, and MAC—working with staff and supported by volunteers from academia, government, and business— have combined their knowledge, networks, and resources through the Steering Committee, Program Committee, and other sub-committees to develop the scientific program, sponsorship, international relations, local activities, workshops, field trips, marketing, and more. The community of volunteers and contributors around RFG2018 includes individuals with diverse expertise, all focused on empowering a new generation to address the availability and management of resources in the future.

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## STEERING COMMITTEE

### GENERAL CHAIR

**John Thompson**, Cornell University and PetraScience Consultants Inc.

### VICE CHAIR

**Bill Mercer**, Avalon Advanced Materials Inc.

### SECRETARY GENERAL

**Andrew Stumpf**, University of Illinois, Urbana-Champaign

### DIRECTORS

**Peter Bobrowsky**, Natural Resources Canada (NRCan), Former IUGS Secretary General

**Stephen Johnston**, International Director, CFES / Councillor IUGS

**Melody Brown Burkins**, Chair, US National Committee for IUGS

**Jim Ryan**, Geological Survey of Canada (GSC) and CFES

**Bill Stiebel**, Past President, CFES

**Garth Kirkham**, President 2015–2016, CIM

**Bob Schafer**, Past President, CIM and Officer, Prospectors & Developers Association of Canada (PDAC)

**Angela Hamlyn**, Executive Director, CIM

**Steve Morison**, President 2017–2018, GAC

**Graham Young**, President 2016–2017, GAC

**David Corrigan**, Science Program Chair, GAC

**Andrew McDonald**, President 2016–2018, MAC

**Paula C. Piilonen**, Vice President 2016–2018, MAC

**Ronald Peterson**, Past President 2016–2018, MAC

**Oliver Bonham**, CEO, Geoscientists Canada

**Walter Willett**, Partnership Development Agent

**David Huntley**, GSC, NRCan

**Glen Nolan**, Missanabie Cree First Nation Chief 2001–2010, Past President, PDAC

**Lisa McDonald**, Executive Director (interim), PDAC

**Lise Bujold**, Director, Conferences & Exhibitions, CIM

# SUPPORTING COMMITTEES

## PROGRAM COMMITTEE

- CO-CHAIRS** **John Thompson**  
Chair RFG2018, Cornell  
University and PetraScience  
Consultants Inc.
- Lana Eagle**  
Aboriginal Relations  
Whitecap Dakota First Nation

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## COMMITTEE MEMBERS

- Roger Beckie**, University of British Columbia  
**Oliver Bonham**, Geoscientists Canada  
**Peter Bobrowsky**, NRCan  
**Mark Cooper**, President,  
Canadian Society of Petroleum Geologists  
**Lesley Hymers**, Mining Matters  
**Kendra Johnston**, Independence  
Gold Corporation, Below BC  
**Jim Ryan**, GSC and CFES  
**Garth Kirkham**, Past-President, CIM  
**Steve Morison**, President, GAC  
**Jim Ryan**, NRCan  
**Rob Stevens**, Canadian International  
Resources and Development Institute  
**Kirstie Simpson**, Program Committee Secretary  
**Glyn Williams-Jones**, Simon Fraser University

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## SOCIAL PROGRAM

- CHAIR** **David Huntley**  
Geological Survey of Canada
- VICE CHAIR** **John Chapman**  
Geological Survey of Canada

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## FUNDRAISING / SPONSORSHIP

- CHAIR** **John Thompson**  
Chair RFG2018, Cornell  
University and PetraScience  
Consultants Inc.
- VICE CHAIR** **Andrew Stumpf**  
University of Illinois at  
Urbana-Champaign

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## EDITORIAL & COMMUNICATIONS

- CHAIR** **Anne Thompson**  
PetraScience Consultants Inc.

## COMMUNITIES & EDUCATION

- EDUCATION** **Lesley Hymers**  
Education and Outreach  
Programs, Mining Matters
- Eileen Van Der Flier**  
Professor  
Simon Fraser University

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## INDIGENOUS COMMUNITIES

- CHAIR** **Lana Eagle**  
Aboriginal Relations  
Whitecap Dakota First Nation
- VICE CHAIR** **Nalaine Morin**  
Principal, ArrowBlade  
Consulting Services

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## STUDENTS & EMERGING LEADERS

- Andy Randall**, Executive Director, Below BC  
**Lindsay Steele**, Practice Advisor, Association  
of Professional Engineers and Geoscientists  
of British Columbia
- Kendra Johnston**, Manager,  
Independence Gold Corporation
- Courtney Jermyn van der Zee**  
Executive Director, Earth Science Matters

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## STAFF

- Lise Bujold**  
CIM Director, Conferences & Exhibitions
- Chantal Murphy**  
CIM Convention Planner and Event Leader
- Janice Burke**  
CIM Technical Program Coordinator
- Martin Bell and Walter Willett**  
CIM Trade Show and Sponsorship Sales Team
- Nadia Bakka**  
CIM Trade Show and Sponsorship Coordinator
- Rachel Séguin**  
CIM Registration Coordinator
- Carol Lee**  
CIM Digital Communications Specialist
- Veronique Jones**  
RFG2018 Special Sessions Coordinator
- Walter Willett**  
Partnership Development Agent



# WHY RFG

**Human existence and progress** is based on a sustainable supply of energy, minerals, and water. In order to provide resources, we must understand the complexity of the earth. Equally important is the need to develop and utilize these resources in better and cleaner ways that minimize impacts. Success will require a consensus on how we work together.

The International Union of Geological Sciences (IUGS), the Canadian Federation of Earth Sciences (CFES), the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), the Geological Association of Canada (GAC), and the Mineralogical Association of Canada (MAC) are partnering to bring together industry, academia, governments, and civil society to tackle these issues.

The Resources for Future Generations conference (RFG2018) takes its theme from a new IUGS initiative of the same name designed to mobilize geoscientists, policy-makers, and other stakeholders to explore resource and related sustainability issues.



RioTinto

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Now the ASI has given its first-ever certification to Rio Tinto's Quebec operations for their compliance with standards for sustainable and responsible aluminium production.

[www.riotinto.com](http://www.riotinto.com)



# DAILY SCHEDULE

Technical Program scheduling is available through the RFG2018 mobile application available at [RFG2018.org](http://RFG2018.org) and on the website itself at [RFG2018.gibsongroup.ca/calendar.php](http://RFG2018.gibsongroup.ca/calendar.php)

**Social Events** \* BYOL (Bring your own lunch)

## SATURDAY, JUNE 16

07:30-09:30	Registration for short course participants	Foyer Level 1
08:00-17:00	GAC Outgoing Council Meeting	202
08:00-17:00	Short Courses (see pages 43-45)	Level 100
09:00-14:00	Sightseeing walking tour: North Shore	Meet at RFG Info Desk
10:00-16:00	Communicating Earth Science Workshop	Simon Fraser University
13:00-17:00	Registration open for all participants	Foyer Level 1

## SUNDAY, JUNE 17

06:30-17:00	Educators' Sea to Sky Geotour Field Trip	Meet at RFG Info Desk
07:30-20:00	Registration	Foyer Level 1
08:00-13:00	GAC Outgoing Council Meeting	202
09:00-16:30	MAC Council Meeting	302
08:00-17:00	Short Courses (see pages 43-45)	Level 100 and 200
<b>09:00-14:00</b>	<b>Sightseeing Walking Tour: Sea-to-Sky Gondola</b>	<b>Meet at RFG Info Desk</b>
10:00-14:00	Sustainability Sunday (Public Event)	Ballroom Foyer – Level 1
12:00-14:00	Canadian Journal of Earth Sciences Editorial Board Meeting (by Invitation)	304
13:00-20:00	Presenters' Preview Room	113
13:00-20:00	Media Room	108
14:30-16:30	GAC President's Reception (by invitation)	201
14:30-16:30	New Activities Strategic Implementation Committee Meeting (by Invitation)	102
16:30-17:00	RFG 2018 Opening Celebration	Ballroom Foyer – Level 1
17:00-20:00	Icebreaker Reception and Trade Show Opening / Meeting Hub / Posters	Exhibit Halls
17:00-20:00	Early Career Delegates Meet Mentors	Early Career Lounge – Exhibit Halls

## MONDAY, JUNE 18

07:30-17:00	Registration	Foyer Level 1
07:30-17:00	Media Room	108
07:30-17:00	Presenters' Preview Room	113
<b>08:30-10:00</b>	<b>RFG2018 Opening Ceremony and Resource Perspectives</b>	<b>Ballroom A</b>
<b>10:30-12:00</b>	<b>Plenary Panel: Resources Opportunities &amp; Constraints</b>	<b>Ballroom A</b>
<b>10:30-12:00</b>	<b>Technical Program (6 Themes, 20 Parallel Rooms)</b>	<b>Level 100 and 200</b>
11:00-17:00	Trade Show / Meeting Hub / Poster Session	Exhibit Halls

## MONDAY, JUNE 18

11:00-17:00	Early Career Lounge	Exhibit Halls
11:30-12:00	GAC Presidential Address	302
12:00-13:30	GAC Awards Luncheon	306
12:00-12:45	Early Career Delegates Meet Plenary Speakers (by Invitation)	201
12:00-13:30	Cash Lunch Concessions	Exhibit Halls
12:15-13:25	Early Career Program Lunchtime Workshop*	211
13:30-14:00	GAC Logan Medalist Address	302
<b>13:30-15:00</b>	<b>Keynote Session: The Earth through Time</b>	<b>Ballroom A</b>
13:30-17:00	Innovation Stage Presentations	Exhibit Halls
<b>13:30-17:00</b>	<b>Technical Program (6 Themes, 20 Parallel Rooms)</b>	<b>Level 100 and 200</b>
15:30-17:00	Reception at the Meeting Hub (Trade Show)	Exhibit Halls
17:15-18:00	AAG Annual General Meeting	208
17:30-19:00	Public Lecture: Between a Rock and a Hard Place	109
<b>19:00-21:00</b>	<b>Student Pub Crawl</b>	<b>Meet at RFG Info Desk</b>

## TUESDAY, JUNE 19

07:30-17:00	Registration Foyer	Level 1
07:30-17:00	Media Room	108
07:30-17:00	Presenters' Preview Room	113
<b>08:30-10:00</b>	<b>Dialogue: The Future of Energy</b>	<b>Ballroom A</b>
<b>08:30-12:00</b>	<b>Technical Program (6 Themes, 20 Parallel Rooms)</b>	<b>Level 100 and 200</b>
<b>10:30-11:15</b>	<b>Keynote Conversation - Alf Barrios and Maryscott Greenwood (Rio Tinto)</b>	<b>Ballroom A</b>
<b>11:15-12:00</b>	<b>Discussion with Resource Leaders</b>	<b>Ballroom A</b>
11:00-17:00	Trade Show / Meeting Hub / Poster Session	Exhibit Halls
11:00-17:00	Early Career Lounge	Exhibit Halls
11:00-17:00	Gathering Place Presentations by Indigenous Leaders	Exhibit Halls
11:30-12:00	MAC Young Scientist Medalist Lecture	302
12:15-13:25	Early Career Program Lunchtime Workshop*	211
12:00-13:30	MAC Awards Luncheon	306
12:00-13:30	Cash Lunch Concessions	Exhibit Halls
<b>13:00-13:45</b>	<b>Rio Tinto: Partnering for a Sustainable Future</b>	<b>Ballroom A</b>
13:30-14:00	MAC Peacock Medalist Lecture	302
<b>13:00-13:45</b>	<b>Keynote Conversation with Simone Niven</b>	
<b>14:00-15:30</b>	<b>Keynote Session: Energy, Water, and Minerals</b>	<b>Ballroom A</b>
<b>13:30-17:00</b>	<b>Technical Program (6 Themes, 20 Parallel Rooms)</b>	<b>Level 100 and 200</b>
15:30-17:00	Reception at the Trade Show (Meeting Hub)	Exhibit Halls
17:15-17:45	MAC Annual General Meeting	304
<b>18:30-21:00</b>	<b>RFG Movie Night: Koneline</b>	<b>Ballroom A</b>



### WEDNESDAY, JUNE 20

07:30-17:00	Registration	Foyer Level 1
07:30-17:00	Media Room	108
07:30-17:00	Presenters' Preview Room	113
08:00-10:00	CIM ExComm Meeting (by Invitation)	304
<b>08:30-10:00</b>	<b>Panel and Keynotes: The North and Arctic</b>	<b>Ballroom A</b>
<b>08:30-12:00</b>	<b>Technical Program (6 Themes, 20 Parallel Rooms)</b>	<b>Level 100 and 200</b>
10:00-14:00	Trade Show / Meeting Hub / Poster Session	Exhibit Halls
10:00-14:00	Early Career Lounge	Exhibit Halls
10:30-13:00	Early Career Speed Mentoring	211
12:00-13:30	Cash Lunch Concessions	Exhibit Halls
12:00-13:30	MDD Awards Luncheon	306
<b>13:30-15:00</b>	<b>Dialogue: Who Owns Resources and Who Benefits</b>	<b>Ballroom A</b>
<b>13:30-17:00</b>	<b>Technical Program (6 Themes, 20 Parallel Rooms)</b>	<b>Level 100 and 200</b>
<b>15:30-17:00</b>	<b>Keynote Session: Water Constraints</b>	<b>Ballroom A</b>
16:00-17:00	GAC Annual General Meeting	302
17:30-19:00	Public Lecture: Water: Can We End the Global Water Crisis?	109
<b>19:00-21:30</b>	<b>AAG Gala Dinner (at the Vancouver Aquarium)</b>	<b>Meet at RFG Info Desk</b>
<b>19:00-21:00</b>	<b>Vancouver Art Gallery Tour</b>	<b>Meet at RFG Info Desk</b>

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### THURSDAY, JUNE 21

07:30-17:00	Registration	Foyer Level 1
07:30-17:00	Media Room	108
07:30-17:00	Presenters' Preview Room	113
08:00-09:00	GAC/MAC Joint Executive Meeting (by Invitation)	302
<b>08:30-10:15</b>	<b>Keynote Session: New Resource Frontiers</b>	<b>Ballroom A</b>
<b>08:30-12:00</b>	<b>Technical Program (6 Themes, 20 Parallel Rooms)</b>	<b>Level 100 and 200</b>
12:00-13:30	Lunch Each on own	
12:15-13:15	Special Lunchtime Speakers – Mineral Supply*	109
<b>13:30-15:30</b>	<b>Technical Program (6 Themes, 20 Parallel Rooms)</b>	<b>Level 100 and 200</b>
<b>13:15-15:15</b>	<b>Conference Session: Innovation Forum</b>	<b>Ballroom A</b>
<b>15:30-17:00</b>	<b>Closing Forum: Future Resources - Changing World</b>	<b>Ballroom A</b>
17:00-18:00	GAC Incoming Council Meeting	302
<b>19:00-21:00</b>	<b>Professional Brewery and Distillery Tour</b>	<b>Meet at RFG Info Desk</b>

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### FRIDAY, JUNE 22

07:30-08:30	Registration	Foyer Level 1
08:00-17:00	Short Courses (see pages 43-45)	Level 100

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### SATURDAY, JUNE 23

09:00-15:00	Earth Science Educator Professional Learning Workshop	Simon Fraser University
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# GENERAL CONFERENCE INFORMATION

All convention activities are being held at the  
**Vancouver Convention Centre West Building.**

1055 Canada Place, Vancouver, BC V6C 0C3

**Phone:** 1-604-689-8232

**Toll-free:** 1-800-785-8232 (North America)

**Fax:** 1-604-647-7232

[info@vancouverconventioncentre.com](mailto:info@vancouverconventioncentre.com)

[vancouverconventioncentre.com](http://vancouverconventioncentre.com)





## WEBSITE

The RFG2018 website is [RFG2018.org](http://RFG2018.org).

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## CONFERENCE LANGUAGE

The official language of the congress is English and all printed materials are published in English.

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## MOBILE APP FOR THE TECHNICAL PROGRAM

For the latest schedule of the complete technical program, please download the mobile application at [RFG2018.org](http://RFG2018.org). The technical program schedule is also available on the website but is not responsive: [RFG2018.org/en/RFG/2018/Technical-Program/Technical-program](http://RFG2018.org/en/RFG/2018/Technical-Program/Technical-program)

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## USB CARD ABSTRACT COMPENDIUM

Abstracts for oral and poster presentations are compiled in the USB Card provided at registration with the printed program.

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## CONFERENCE UPDATES

Complete and updated information and descriptions, if not provided in the printed program, are available at [RFG2018.org](http://RFG2018.org). Only the technical program is featured on the mobile application.

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## REGISTRATION AND BADGE REPLACEMENT

The registration desk is located in the level 100 foyer of the West Building. Delegates must register before accessing the technical sessions, meeting hub, trade show, purchasing tickets for social functions or for participating in any activity. The deadline for all refunds was April 30. No refunds will be issued. No exceptions. The conference badge must be worn at all time. Replacement badges can be obtained for \$25 plus tax.

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## REGISTRATION DESK SCHEDULE

Saturday, June 16	13:00 - 17:00
Sunday, June 17	07:30 - 20:00
Monday, June 18	07:30 - 17:00
Tuesday, June 19	07:30 - 17:00
Wednesday, June 20	07:30 - 17:00
Thursday, June 21	07:30 - 17:00
Friday, June 22	07:30 - 08:30

## GENERAL INFORMATION

### RFG INFORMATION COUNTER

Located in the registration area, the RFG Information Booth is where all your conference questions are answered. It is open during registration hours.

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### TOURISM VANCOUVER BOOTH

Tourism Vancouver booth is located in the registration area. Questions regarding city attractions, public transportation and services, tour bookings or restaurant information can be obtained here.

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### MEDIA ROOM

Members of the Media are invited to use the Media Room – **Room 108**.

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### PRESENTERS' PREPARATION ROOM

**Room 113** has all the necessary audio-visual equipment to review presentations, allowing presenters to become better acquainted with the equipment of technical rooms. Room 113 hours:

<b>Sunday, June 17</b>	13:00 – 20:00
<b>Monday, June 18</b>	07:30 – 17:00
<b>Tuesday, June 19</b>	07:30 – 17:00
<b>Wednesday, June 20</b>	07:30 – 17:00
<b>Thursday, June 21</b>	07:30 – 15:30

**IMPORTANT:** Do not upload your PPT at the preparation room. You must do so at the mandatory meeting with your session chair (see schedule below).

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### MANDATORY MEETING TIMES FOR PRESENTERS AND SESSION CHAIRS

Authors presenting and individuals chairing/co-chairing sessions on a given day must meet on that very day to review scheduling and upload presentations in the room's computer. **Please do not upload your presentation in the preparation room.**

#### Mandatory meeting times from

Monday, June 18 to Thursday, June 21:

**Presenters/Session chairs of morning sessions:**  
07:45 – 08:30

**Presenters/Session chairs of afternoon sessions:**  
12:45 – 13:30

### EARLY CAREER LOUNGE

Join your fellow Early Career Delegates for an opportunity to mix and mingle at the Early Career Lounge. This is a great meeting place for mentors and mentees to chat—potential employers and candidates too. Friends will put their feet up, take a break, exchange knowledge, network, and just relax!

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### POSTER SESSION

More than 200 posters are presented in the Meeting Hub, from Sunday evening to closing on Wednesday. Meet the authors for the latest technologies and projects under each Technical Program Theme.

Poster presenters are encouraged to be at the posters as much as possible, particularly in lunch and coffee breaks. Poster presenters are expected to be in front of their posters:

<b>Monday, June 18</b>	from 16:00 to 17:00
<b>Tuesday, June 19</b>	from 16:00 to 17:00

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### LUNCH TIME

Food concessions are offering a variety of lunch items for purchase daily. Having lunch on the trade show floor will keep the RFG community networking and getting to the afternoon sessions on time.

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### DAILY RECEPTIONS

The Icebreaker reception kicks it all off on Sunday, from 17:00 to 20:00. Be among the first to visit the RFG2018 Trade Show exhibits!

Grab a beer on Monday and Tuesday, from 15:30 to 17:00. Peers and friends will gather at the Trade Show, visit the exhibitors and discuss the day's technical sessions.

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### PHONE CHARGING STATIONS AT THE RFG LOUNGE

Delegates are welcome to use the complimentary phone charging units at the RFG lounge – **booth 516** – during the trade show hours.

## RFG PARTNERS' BOOTHS



### **CIM (CANADIAN INSTITUTE OF MINING, METALLURGY AND PETROLEUM)**

Find out everything you ever wanted to know about CIM at **booth 309**. Get your copy of the CIM Magazine today. Soon, you'll want to receive it digitally! Come learn how members benefit from the Institute's technical content, belonging to societies and branches, attendance at events and conventions, and being part of a community of 10,000 mining industry experts and decision makers. While there, fill out a membership form and join this elite group of industry leaders.

Be sure to visit [www.cim.org](http://www.cim.org) to discover this year's award winners, distinguished lecturer and all else you need to know on member services and opportunities.



### **GAC (GEOLOGICAL ASSOCIATION OF CANADA)**

Visit GAC representatives at **booth 501** and check out new and recent book releases and their journal: Geoscience Canada. Be sure to join or renew your membership, and see who has been honoured with top prizes this year, including the Logan, Neale, Ambrose, and Hutchison Medalists. And take advantage of deep discounts to access journals such as the Canadian Journal of Earth Sciences (CJES), the Canadian Geotechnical Journal, the Canadian Journal of Soil Sciences, and Environmental Reviews.

No time to visit the booth? Check out all the details on our website at [www.gac.ca](http://www.gac.ca).



### **MAC (MINERALOGICAL ASSOCIATION OF CANADA)**

You are invited to drop by **booth 400** to check our publications from the Special Issues of The Canadian Mineralogist, our Special Publications and our Topics in Mineral Sciences formerly Short Course volume series. Sign in or renew your membership; your complimentary subscription to the Elements magazine – An International Magazine of Mineralogy, Geochemistry, and Petrology, alone is worth the price of your membership. Online and print subscriptions to the Canadian Mineralogist also available.

Visit [www.mineralogicalassociation.ca](http://www.mineralogicalassociation.ca) to check the publications list and complete membership benefits.



## THE MEETING HUB - EXHIBIT HALL

The RFG2018 exhibit hall is renamed the Meeting Hub as this is where the action and networking happens! The trade show is at the heart of the various Meeting Hub elements bringing delegates together daily: the poster presentations, the Gathering Place, Innovation Stage Presentations, food cash concessions, daily receptions, the Early Career Lounge, rest areas and more. All Events and Activities at the Meeting Hub will follow Trade Show Hours:

<b>Sunday, June 17</b>	17:00 - 20:00	<b>Monday, June 18</b>	11:00 - 17:00
<b>Tuesday, June 19</b>	11:00 - 17:00	<b>Wednesday, June 20</b>	10:00 - 14:00

## SUSTAINABILITY SUNDAY

10:00-14:00 | **SUNDAY, JUNE 17**

BALLROOM FOYER - LEVEL 1

**LOCATION:** West Convention Centre, Ballroom Foyer, Level 1

**PRICE:** Free. Open to the Public

Sustainability Sunday is featuring a variety of displays and interactive exhibits designed to intrigue, delight and inform! All ages are welcome to this family friendly public event taking place in the Foyer area of the West Convention Centre.



## INNOVATION STAGE PRESENTATIONS

**DAY:** Monday, June 18

**TIME:** 13:30 to 17:00

**PLACE:** Meeting Hub Stage

Sponsors and exhibitors are invited to make short presentations of innovative products, technology and business solutions. The schedule of presentations is posted at the entrance of the area and in this program. One day only.

**SCHEDULE:**

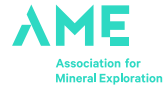
13:30	Seequent	15:10	Queen’s University
13:50	BGC Engineering	15:30	Olympus Scientific
14:10	Pix4D	15:50	IUGS 36th International Conference
14:30	IMDEX-Reflex	16:10	UBC – MEL program
14:50	IsoMass	16:30	Royal Roads University

CONFERENCE HIGHLIGHTS





# THE GATHERING PLACE



**DAY:** June 19, 11:00 to 17:00

**PLACE:** Meeting Hub Stage

The Gathering Place will focus on examples of benefits and opportunities in the responsible resource development industry with a Canadian Indigenous perspective. AME has a proud tradition of presenting The Gathering Place at the annual Roundup conference and is pleased to expand the program to RFG2018 this year. The sharing of success stories including partnerships and perspectives will be of benefit to those wishing to pursue responsible, timely and mutually beneficial projects within Canada.

## WELCOME AND OPENING

Join us as we kick off this day of dynamic programming with a traditional welcome to the Coast Salish territory as well as opening comments from our sponsors and AME.

### Indigenous Welcome

**MODERATOR:** Lana Eagle,  
Whitecap Dakota First Nation

**AME COMMENTS:** Edie Thome, AME

## PANEL SESSIONS - ONE HOUR EACH

### 1. Advancing Economic Development: Building Communities Through Mineral Exploration and Development

The panel will showcase examples of the benefits from successful partnerships in the mineral exploration and development industry that have been realized by the for communities in which they work.

## 30 MINUTE LUNCH BREAK

### 2. Working Together to Achieve Social License

Industry and community business development perspectives are showcased in this conversation which should inspire and guide those looking to form respectful, fruitful partnerships that stand up over time.

### 3. Defining Sustainability in the Natural Resource Industry

A discussion on the different meaning of sustainability to communities, companies and others – seeking consensus in the context of natural resources.

### 4. Traditional Knowledge and Western Science: A Powerful Combination

Learning from different perspectives and to enhance natural resource development and successful management.

### 5. Benefits of Utilizing Local Knowledge, Workforces and Supplies

A case history example of a successful partnership between We Wai Kai (Cape Mudge), We Wai Kum (Campbell River) and BC Hydro that has spanned over many years and projects.

## WRAP UP AND CLOSING

**MODERATOR:** Lana Eagle,  
Whitecap Dakota First Nation

**CLOSING COMMENTS:** Edie Thome, AME

Sponsor: **Teck**

Supporter: **HATCH**



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# PARTNERS' LECTURES & ADDRESSES

Room 302

11:30-12:00 | **MONDAY, JUNE 18**

## **GAC Presidential Address**

Stephen Morison, GAC President 2017-2018

Steve Morison is a two-time GAC President, having served in the position in 2001-2002 before returning 15 years later. Educated at Queen's University and the University of Alberta, Steve served as Chief Geologist and Director, Mineral Resources for the Department of Indian and Northern Affairs before moving into the private sector as VP Business Development for Gartner Lee Limited. Steve took this experience with him to join ALS Laboratory Group in 2009 as their VP North America, Minerals. Five years ago, he opted for life in Vancouver as a consultant. Steve is a senior manager and technical professional who has a superior track record of performance in the public sector and private sector for more than 35 years. Areas of specialization includes business management and strategic advice, natural resources project approvals including regulatory specialist and environmental assessment management, engagement and consultation and facilitation/mediation.



13:30-14:00 | **MONDAY, JUNE 18**

## **GAC Logan Medalist Address**

Barbara Sherwood Lollar, University of Toronto

Barbara Sherwood Lollar's innovative applications of compound specific stable isotope analysis have revolutionized geochemistry, notably by establishing the source and fate of anthropogenic organic contaminants in groundwater, and also the presence of abiogenic methane and hydrogen trapped, for more than 1 billion years, in crystalline rocks that are more than 2 km below the surface of the Canadian Shield.

Her research has involved extensive collaboration with industrial partners, consultants and regulators in Canada, United States, and Europe. She has lectured widely in North America, Europe, and worldwide on her scientific findings and their implications, on water quality issues, on the remediation of contaminated groundwater resources, on 'carbon capture' and subsurface 'carbon' isolation and storage. At the same time, Barbara has contributed important leadership and support to the international geochemistry community. She has served as president of the international Geochemical Society, Editor-in-Chief of the international journal Chemical Geology, and Editor of Volume 8 (Environmental Geochemistry) in the award-winning major reference work: Treatise on Geochemistry. She also provided scientific support to many other organizations such as: NSERC, the Canadian Space Agency, the Canadian Nuclear Waste Management Organization, UNESCO, International Atomic Energy Agency, the US National Research Council; NASA, the U.S. Environmental Protection Agency, and the U.S. Department of Energy. She has received many prestigious awards and appointments, including: F.R.S.C., Fellow of the AGU, the Eni Award in Protection of the Environment from the President of Italy, NSERC's 2016 John C. Polanyi Award, and Companion of the Order of Canada.

### MAC Young Scientist Medalist Lecture

Matthew Steele-MacInnis, Assistant Professor, University of Alberta

#### “Hydrothermal properties of geologic fluids: Causes and consequences”

Fluids are the primary agents of mass and energy transport within and between geologic reservoirs. Within the Earth, hot aqueous fluids circulate and interact with rocks, driving chemical reactions and transporting heat and solutes, thus exerting strong controls on a wide range of phenomena including metasomatism and the formation of mineral deposits. Depending on geologic setting, fluids exhibit extremely wide ranges of chemical composition, and circulate at temperatures and pressures ranging from ambient to extreme. Consequently, geologic fluids show wide ranges of physical and chemical properties, which results in diverse styles of hydrothermal alteration, transport of dissolved components, and mineralization. Recent studies, using various approaches, have provided new insights into the properties of fluids at extreme conditions, with attention to the relationship between thermodynamic and atomic-scale properties such as solvation, speciation and molecular structure of the fluid. This talk explores some of these phenomena in light of recent advances and future prospects, in the context of geologic processes involving hydrothermal fluids.



### MAC Peacock Medalist Lecture by Stearns A. Morse,

Prof. Emeritus, University of Massachusetts

#### “Gifts of a Lifetime in Earth Science”

In “The Search”, a novel by C. P. Snow, there is the line “I had been presented with a discovery.” This, of course, turns out to be flawed, and there goes the claim to fame. But a student of the Earth can hardly help making discoveries routinely. When we do experiments in petrology, every run gives us something never seen before by man or beast. Every thin section we pick up shows us something new and unexpected if we look carefully enough in the petrographic microscope: think what Marion Holness has given us with her painstaking studies of triple junctions seen in thin section and requiring the use of the universal stage (oh, horror!) in the Skaergaard Intrusion of Greenland. My point is that among all scientists, we who study the Earth have an infinity of discoveries before us and that makes us happy and possibly even productive. In my talk I hope to mention some of the remarkable moments of my life in science, but also to profile a few special characters whose astounding work we have had the pleasure of celebrating recently.



# CONFERENCE OPENING & PLENARY

Monday, June 17 | Ballroom A

Sponsor:

# RioTinto

## 8:30-10:00 | OPENING CELEBRATION AND RESOURCE PERSPECTIVES

Indigenous celebration and welcome to the traditional lands of the Coast Salish people and the Musqueam, Squamish, and Tsleil-Waututh First Nations, and welcome to British Columbia from BC Minister Hon. Bruce Ralston and Canada - followed by perspectives on resources from BC Minister Hon. George Heymen and renowned Vancouver teacher, speaker, writer and "once" lawyer, Glenn Sigurdson.

## 10:30-12:00 | RESOURCES OPPORTUNITIES AND CONSTRAINTS

## PLENARY

Sources and constraints: an overview of resource opportunities and challenges, including available sources, environmental and human constraints, challenges, and imperatives.

### MODERATOR



#### Allyson K. Anderson Book

Executive Director of the American Geosciences Institute, an organization which serves the needs of the U.S. geosciences community, while also connecting society to the geosciences globally.

### PANELISTS



#### Ross Beaty

Chairman of Pan American Silver Corp. and of Equinox Gold Corp. Mr. Beaty is also a well-known environmental philanthropist, primarily through The Sitka Foundation.



#### Tzeporah Berman

Strategic advisor for dozens of environmental organizations, First Nations and philanthropists on clean energy, oil sands and pipelines. She is the author of *This Crazy Time: Living Our Environmental Challenge*.



#### Richard Chuchla

Director of the Energy and Earth Sciences (EER) graduate program and Leslie Bowling Professor in Geological Sciences, University of Texas-Austin.



#### Gavin Mudd

Associate Professor of Environmental Engineering at RMIT University in Melbourne, Australia. Gavin is a renowned global expert on the environmental impacts and sustainability of mining.



The 36th session of IGC will cover the entire gamut of Geosciences backed by an exhaustive Science Program comprising ~ 42 themes and a spectacular array of 50 Field Excursions ranging from 1 day short visit to 5 days guided tours.

This Congress will also offer a liberal Geohost Program including support for member countries of international Union of Geological Sciences (IUGS). Business meetings, short courses and workshops on thrust areas in geosciences and GeoExpo are other key features of this congress.

The Indian subcontinent with its unique diversity of terrain, people and its rich cultural heritage invites the world Geoscientific community to converge in India during the 36th session of IGC at Delhi in 2020 and participate for developing Geosciences for a better tomorrow and a sustainable future.

**The First Circular of 36th is available for download at [www.36igc.org](http://www.36igc.org).**

# INDIAN SUBCONTINENT

The Natural Choice for 36th IGC, 2-8 March, 2020

**T**he International Geological Congress (IGC), the Olympics of Geological Sciences is returning to Indian soil after a gap of 56 years in 2020. The Congress shall be held at India Expo Centre & Mart Ltd., NCR, Delhi

36th IGC, a global platform to advance the cause of Earth Sciences is being hosted by the Ministry of Mines and the Ministry of Earth Sciences, Government of India with active support from the Indian National Science Academy and science academies of neighboring countries, viz. Bangladesh, Nepal, Pakistan and Sri Lanka. The Geological Survey of India is the nodal organization for this event.

The subcontinent with mighty Himalayas and its glaciers, deep gorges and vast alluvial plains, plateaus, peneplains, cold and warm deserts, the largest deltas with mangroves and mesmerizing sun drenched beaches, each with its own unique enticing geology representing Archaean crustal nuclei to present day volcanism and geo-heritage sites is a must see for geo-tourist bugs.

**Visit 36th IGC Stand (300 & 302) at RFG 2018**



Contact: 36th International Geological Congress  
C-II, Pushpa Bhavan, Madangir Road, New Delhi-110062, INDIA  
Tel: +91 11 29965750, 26057035  
Email: [igc.delhi2020@nic.in](mailto:igc.delhi2020@nic.in), Website: [www.36igc.org](http://www.36igc.org)



## THEMATIC KEYNOTE SESSIONS

The four-day technical program will feature themed keynote sessions on all days in **Ballroom A** of the Vancouver Convention Centre.

### MONDAY, JUNE 18

**13:30-15:00 | THE EARTH THROUGH TIME**

**KEYNOTES**

Some of the major tectonic, magmatic, geochemical and biological changes that have occurred on Earth over time and their implications for resources needed to sustain humans.

**CHAIR:** Libby Sharman, Principal Global Geoscientist, BHP Chile

#### KEYNOTE SPEAKERS



**Richard Ernst**  
Scientist in Residence  
at Carleton University,  
Ottawa, Canada and Guest  
Professor, Tomsk State  
University, Siberia, Russia.



**Michel Jébrak**  
UQAT-UQAM Chair in  
Mining Entrepreneurship,  
Université du Québec à  
Montréal.



**Christopher Reinhard**  
Assistant Professor of  
Biogeochemistry, School  
of Earth and Atmospheric  
Sciences at Georgia  
Institute of Technology.



**Dominique Weis**  
Canada Research Chair  
(Tier I) in the Geochemistry  
of the Earth's Mantle,  
University of British  
Columbia.

TUESDAY, JUNE 19

8:30-10:00 | THE FUTURE OF ENERGY

FOCUSED DIALOGUE

How will we continue to increase our supply of energy to meet human needs while minimizing the impact on the environment? Energy supply is changing, but how fast will it happen?

## MODERATOR



**Edie Thome**  
Association for Mineral  
Exploration (AME)

## PANELISTS



**Merran Smith**  
Founder and Executive  
Director of Clean  
Energy Canada.



**Scott Tinker**  
Director of the Bureau of Economic Geology and the  
State Geologist of Texas; Past President of the American  
Association of Petroleum Geologists and the Association  
of American State Geologists.

10:30-11:15 | KEYNOTE CONVERSATION - RIO TINTO

## LEADERS



**Alf Barrios**  
CEO  
Rio Tinto Aluminum



**Maryscott Greenwood**  
CEO, Canadian American  
Business Council

11:15-12:00 | DISCUSSION WITH RESOURCE LEADERS

## LEADERS



**Rod Bull**  
Vice President and General Manager, North America  
Komatsu Mining Division

Sponsor:

**KOMATSU**

13:00-13:45 | RIO TINTO: PARTNERING FOR A SUSTAINABLE FUTURE



**Simone Niven**  
Corporate Relations Group Executive,  
Rio Tinto



## TUESDAY, JUNE 19

14:00-15:30 | ENERGY, WATER AND MINERALS

KEYNOTES

Energy supply and use – relationship to water and mineral extraction.

**CHAIR:** Colleen Giroux-Schmidt, VP Corporate Relations, Western Region, Innergex

## KEYNOTE SPEAKERS



**Kevin Book**  
Head of the research team, ClearView Energy Partners, LLC, an independent research firm headquartered in Washington D.C.



**Mark Poweska**  
Executive Vice-President, BC Hydro's Operations business group.



**Jasmin Raymond**  
Research Chair, Institut National de la Recherche Scientifique (INRS), Québec City



**Gareth Manderson**  
Rio Tinto BC Works General Manager

## WEDNESDAY, JUNE 20

8:30-10:00 | THE NORTH AND ARCTIC

PANEL AND KEYNOTES

An introduction from northern political and Indigenous leaders followed by overviews of the critical geoscientific data, and the relationship to Indigenous communities and resource development.

## MODERATOR



**Stephen Morison**  
President, Geological Association of Canada; SRM Consulting Ltd.



**Hon. Wally Schumann**  
Minister Industry, Tourism and Investment, NWT



**Glenn Mason**  
Assistant Deputy Minister Natural Resources Canada



**Ailsa Barry**  
Vice-President, Experience and Engagement, Canadian Museum of Nature



**Holly Steenkamp**  
Regional Mapping Geoscientist, Canada-Nunavut Geoscience Office, Iqaluit, Nunavut.

## WEDNESDAY, JUNE 20

13:30-15:00 | WHO OWNS RESOURCES AND WHO BENEFITS

DIALOGUE

Who owns resources and who ultimately benefits from resources?  
Should this change and how will change happen?

**MODERATOR****Jessica Bratty**

Principal, Confluence Solutions. Facilitator, mediator and strategic engagement practitioner in complex planning and decision making processes.

**PANELISTS****Cynthia Callison**

Cynthia is the Chair of the First Peoples Cultural Council and an advisory council member of (CIRDI) Canadian International Resources and Development Institute.

**Tony Hodge**

Senior Scholar in Residence at the Robert M. Buchan Department of Mining Engineering, Queen's University, Kingston, Ontario and past President, International Council on Mining and Metals.

**Ian Gill**

Principal of Cause + Effect

**Hon. Doug Donaldson**

Minister of Forests, Lands, Natural Resource Operations and Rural Development, BC

## WEDNESDAY, JUNE 20

15:30-17:00 | WATER CONSTRAINTS

KEYNOTES

What controls and limits the supply of water globally and locally? How do we evaluate the availability and sources of water and how does that impact mining and Indigenous communities?

**CHAIR:** Diana Allen, Professor Department of Earth Sciences, Simon Fraser University

## KEYNOTE SPEAKERS



**Paul Bauman**  
Principal, Paul Bauman  
Geophysics and Technical  
Director of the Near Surface  
Geophysics group of  
Advisian WorleyParsons.



**Jay Famiglietti**  
Senior Water Scientist at  
the United States National  
Aeronautics and Space  
Administration (NASA)  
Jet Propulsion Laboratory,  
California Institute of  
Technology.



**Jason Gurdak**  
Associate Professor in  
the Department of Earth  
& Climate Sciences and  
Associated Faculty in  
Environmental Studies, San  
Francisco State University.



**Nalaine Morin**  
Principal at ArrowBlade  
Consulting Services,  
providing services in  
technical review, regulatory  
support, negotiations,  
community consultation,  
and environmental  
resource management.



## SEQUENT

SEE YOUR DATA TELL  
A STORY

Booth 317

## THURSDAY, JUNE 21

8:30-10:15 | NEW RESOURCE FRONTIERS

KEYNOTES

Where will we find and extract resources in the future - on the sea floor deposits, at depth, in new environments that host critical elements, in remote parts of Africa, or through recycling? What are the boundaries for the future?

**CHAIR:** Betsy Friedlander, Senior Project Geologist, Teck Resources Ltd.

## KEYNOTE SPEAKERS



**Richard Blewett**  
General Manager of the Minerals Systems Branch, Geoscience Australia.



**Kathryn Goodenough**  
Principal Geologist, British Geological Survey (BGS) and Deputy Director, BGS Global.



**Jennifer Graham**  
Technical Advisor and Project Manager to artisanal mining projects in the Democratic Republic of Congo and the Central African Republic, TetraTech ARD.



**Christian Hagelüken**  
Director of European Union Government Affairs, Umicore.



**Sven Petersen**  
Research Scientist  
GEOMAR, Helmholtz Centre for Ocean Research, Kiel, Germany.



THURSDAY, JUNE 21

13:15-15:15 | INNOVATION FORUM

CONFERENCE SESSION

What is the role of innovation, from social to impact investing, to new business models, technology and carbon capture? How do we evaluate and communicate data, ideas, and resource development?

**CHAIR:** Victoria Sterritt, Lead, Technology & Innovation, Teck Resources Ltd.

## PANELISTS

**Greg Dipple**

Professor in the Department of Earth, Ocean and Atmospheric Sciences and Director of the Bradshaw Research Initiative for Minerals and Mining at the University of British Columbia.

**Caroline Rossignol**

Director Sustainability and Social Performance  
Lundin Mining.

**Matthew Lato**

Senior Engineer at BGC and Adjunct Professor in the Department of Geological Sciences and Geological Engineering, Queen's University.

**Susan Morrice**

Founder of Belize Natural Energy LTD and International Natural Energy LLC.

**Adam Pidlisecky**

Chief Research Officer  
Seequent

**Joy Romero**

Vice President, Technology & Innovation, Canadian  
Natural Resources Limited.

**Laurel Sabur**

Impact Investing Consultant and Faculty Member, Corporate Social Responsibility (CSR) Training Institute.



THURSDAY, JUNE 21

15:30-17:00 | FUTURE RESOURCES - CHANGING WORLD

CHANGING WORLD

Can we find and deliver resources; can we meet the needs of a rapidly developing and technological world; can we do this better to assist Indigenous people and developing countries; can it be done in an environmentally responsible manner?

**MODERATOR****Stephen D'Esposito**

Stephen D'Esposito is the President and CEO of RESOLVE.

**PANELISTS****Robert Armstrong**

Director, MIT Energy Initiative – an Institute-wide initiative at the Massachusetts Institute of Technology.

**Tamlyn Botel**

Technical Lead of the Territorial Stewardship Department, Citw Nlaka'pamux Assembly (CNA).

**Megan Leslie**

Head of World Wildlife Fund Canada, previously Member of Parliament representing Halifax, Nova Scotia.

**John Ludden**

Executive Director British Geological Survey.



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## LUNCH SPEAKERS

Thursday, June 21 | Room 109

12:15-13:15 | MINERAL SUPPLY

LECTURES

Two lectures examining the availability and supply of different minerals and critical importance to the modern world.

**CHAIR:** John Thompson, Professor, Department of Earth and Atmospheric Sciences, Cornell University.

### SPEAKERS



#### Simon Jowitt

Assistant Professor in Economic Geology, University of Las Vegas. He has extensive expertise in mineral economics and the "economic" side of economic geology, and has several recent publications on global Cu, Ni, Co, Pb-Zn, rare earth element, and indium resources.



#### Thomas Graedel

Professor of Industrial Ecology Emeritus, School of Forestry and Environmental Studies, Yale University. His research is centered on developing and enhancing industrial ecology, the organizing framework for the quantification and transformation of the material resource aspects of the Anthropocene.





## EVENING PUBLIC LECTURES

17:30-19:00 | Monday, June 18 and Wednesday, June 20 | Room 109

### MONDAY | BETWEEN A ROCK AND A HARD PLACE



**IAIN STEWART**, Professor of Geoscience Communication and the Director of the Sustainable Earth Institute at Plymouth University.

Iain is a geologist who spends much of his time writing and talking about our planet—how it works, its volatile history, and what all that means for those living on it. As an academic earth scientist, Iain specializes in recent geological change. As a talented communicator, he has presented major BBC film series on the nature, history, and state of the planet. Stewart was appointed Member of the Order of the British Empire in 2013 and awarded the European Federation of Geologists Medal of Merit 2016 for his outstanding contribution in elevating the profile of geology around the world.

### WEDNESDAY | WATER: CAN WE END THE GLOBAL WATER CRISIS?



**JAY FAMILIETTI**, Senior Water Scientist at NASA's Jet Propulsion Laboratory at the California Institute of Technology and incoming Canada 150 Research Chair, University of Saskatchewan

Famiglietti is a hydrologist who uses satellites and develops advanced computer models to track how freshwater availability is changing globally. He has published nearly 150 peer-reviewed research papers, as well as numerous reports. His team's pioneering work on remote sensing of groundwater depletion has influenced water management decisions from California to India. A fellow of the American Geophysical Union and of the Geological Society of America, he is a frequent speaker and an avid writer, and he is committed to science communication. Famiglietti is a regular advisor to the U.S. Congress and the California Governor's Office on water availability and water security issues. He has testified before the U.S. Congress, and has participated in numerous White House, U.S. State Department, Congressional, Pentagon, and California State Legislature briefings.



# SHORT COURSES

RFG is offering a large variety of pre- and post-conference short courses. All short courses will be held at the Vancouver Convention Centre, with the exception of Communicating Earth Science: Interactive Professional Development for Everyone on Saturday, June 16. If you wish to register for a short course only (not for the conference), the short course fee will be \$100 more than the listed price.

**Expand your knowledge  
and your worldview with us.**

## PRE-CONFERENCE TWO-DAY SHORT COURSES

SATURDAY AND SUNDAY, JUNE 16-17

### Three-Dimensional Geological Mapping

**TIME:** 8:30 to 16:30

**ROOM:** 121

**SHORT COURSE ORGANIZER:** Minnesota Geological Survey

**PRICE:** \$240. Includes course notes, coffee breaks and 2 luncheons.

### Best Practices in Mineral Deposit Evaluation

**TIME:** 8:00 to 17:00

**ROOM:** 111

**SHORT COURSE ORGANIZER:** GeoGlobal, LLC

**PRICE:** \$750. Includes course notes, coffee breaks, and 2 luncheons.

## PRE-CONFERENCE ONE-DAY SHORT COURSES

SATURDAY, JUNE 16

### Applied Isotope Geochemistry

**TIME:** 8:30 to 17:00 on Saturday

**ROOM:** 115

**SHORT COURSE ORGANIZER:** Mineralogical Association of Canada

**PRICE:** \$350 for professionals. \$130 for students.

Includes course notes, coffee breaks and lunch.

### Communicating Earth Science: Interactive Professional Development for Everyone

**LOCATION:** Simon Fraser University, Vancouver Campus (Harbour Centre),  
515 West Hastings Street, Vancouver

**TIME:** 10:00 to 16:00

**PRICE:** \$50. Includes lunch.

SUNDAY, JUNE 17

### The Use of Geochemical Data for Forensic Intelligence and Provenancing

**TIME:** 8:30 to 18:00

**ROOM:** 116

**SHORT COURSE ORGANIZER:** National Centre for Forensic Studies, University of Canberra, Australia.

**PRICE:** \$250. Includes course notes and coffee breaks (no lunch).



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**SUNDAY, JUNE 17**

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### **Mineral Chemistry: Applications to Mineral Exploration**

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**TIME:** 8:00 to 17:45

**ROOM:** 117

**SHORT COURSE ORGANIZER:** Association of Applied Geochemists

**PRICE:** \$350 for professionals. \$175 for students. Includes course notes, coffee breaks and luncheon.

---

### **Your Career and Public Reporting - A QP Short Course for Students**

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**TIME:** 8:30 to 16:30

**ROOM:** 119

**SHORT COURSE ORGANIZER:** Geoscientists Canada

**PRICE:** Free of charge for student delegates and \$150 for professionals. Includes coffee breaks only.

---

### **Exploration Geochemistry: From Fundamentals to the Field**

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**TIME:** 8:00 to 18:00

**ROOM:** 114

**SHORT COURSE ORGANIZER:** Association of Applied Geochemists

**PRICE:** \$350 for professionals. \$175 for students. Includes course notes, coffee breaks and lunch.

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## **POST-CONFERENCE ONE-DAY SHORT COURSES**

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**FRIDAY, JUNE 22**

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### **Advanced Concepts in Evaluating and Interpreting Geochemical Data**

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**TIME:** 8:00 to 17:00

**ROOM:** 111

**SHORT COURSE ORGANIZER:** Association of Applied Geochemists

**PRICE:** \$350 for professionals. \$175 for students. Includes course notes, coffee breaks, and lunch.

---

### **Large Igneous Province Research frontiers (Including Resource Exploration and Climate Change)**

---

**TIME:** 8:00 to 17:00

**ROOM:** 116

**SHORT COURSE ORGANIZER:** Geological Association of Canada

**PRICE:** \$250. Includes coffee breaks and lunch.

---

### **Building Lasting Asset Value – Practical Ways to Integrate Corporate Social Responsibility into Mineral Exploration and Development Projects**

---

**TIME:** 8:30 to 16:30

**ROOM:** 117

**SHORT COURSE ORGANIZER:** Association for Mineral Exploration (AME)

Integrated Social Responsibility (ISR) Committee

**PRICE:** \$300. Includes course notes, coffee breaks and lunch.

---



# FIELD TRIPS

RFG 2018 is offering a large variety of pre- and post-conference field trips.

Explore our offerings and see how far RFG can take you!

## PRE-CONFERENCE FIELD TRIPS

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### MDRU Southern BC Porphyry Field Trip

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**LOCATION:** Princeton and Kamloops, British Columbia

**DURATION:** 7 days – Saturday, June 9 to Friday, June 15

**FIELD TRIP SPONSOR:** Mineral Deposits Research Unit (MDRU)

**CONTACTS:** Craig Hart and Jeanne Liu, MDRU/BRIMM

---

### The Cretaceous-Cenozoic Coast-Cascade Orogen: The Chilliwack Valley Harrison Lake Connection

---

**LOCATION:** Chilliwack, British Columbia

**DURATION:** 2 days – Thursday and Friday, June 14 and 15

**FIELD TRIP SPONSOR:** Canadian Tectonics Group Division of the Geological Association of Canada (GAC)

**CONTACTS:** Dan Gibson, Simon Fraser University; and Jim Monger, Geological Survey of Canada

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### Urban Geology and Geoheritage of Metro Vancouver, British Columbia

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**LOCATION:** Vancouver, West Vancouver, Coquitlam, Port Moody, and Maple Ridge

**DURATION:** 1 day – Friday, June 15

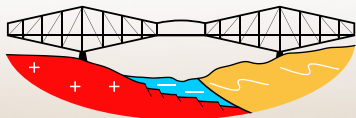
**FIELD TRIP SPONSOR:** Geological Association of Canada

**CONTACTS:** Lionel Jackson, Simon Fraser University; and Michael Wilson, Douglas College

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**AGC-AMC-AIH**  
QUÉBEC 2019  
Où les géosciences convergent



**GAC-MAC-IAH**  
QUÉBEC 2019  
Where geosciences converge

Three geological provinces converge toward Quebec City:  
the Grenville, the St. Lawrence platform and the Appalachians.

In 2019, three geoscientific associations will also converge toward  
Quebec City: GAC, MAC, IAH-CNC.

Come and join us.



Trois provinces géologiques convergent vers Québec :  
le Grenville, la plateforme du Saint-Laurent et les Appalaches.

En 2019, trois associations géoscientifiques convergeront  
aussi vers Québec : AGC, AMC, AIH-SNC.

Soyez des nôtres.

Québec, May 12-15 2019

Québec, 12 - 15 mai 2019

[gacmac-quebec2019.ca](http://gacmac-quebec2019.ca)



GEOLOGICAL  
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MINERALOGICAL  
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ASSOCIATION  
MINÉRALOGIQUE DU CANADA



International Association  
of Hydrogeologists  
Association internationale  
des hydrogéologues



## POST-CONFERENCE FIELD TRIPS

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### **The Tulameen Alaskan-Type Ultramafic-Mafic Intrusion: Architecture, Emplacement Mechanisms, and CR-PGE vs CU-PGE “Reef-Style” Mineralization in a Convergent Margin Setting**

---

**LOCATION:** Hope, Princeton, Tulameen

**FIELD TRIP SPONSOR:** Mineralogical Association of Canada

**CONTACTS:** Graham Nixon and Dejan Milidragovic

**DURATION:** 3 days – Thursday, June 21 (evening travel) to Sunday, June 24

**DEPARTURE FROM:** Front entrance of the VCC (Burrard Street)

**DEPARTURE TIME:** 15:00

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### **Upper Fir Carbonatite-Hosted Nb-Ta Deposit**

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**LOCATION:** Blue River area, East-Central British Columbia

**FIELD TRIP SPONSOR:** Mineralogical Association of Canada

**CONTACTS:** Alexei S. Rukhlov

**DURATION:** 3 days – Friday, June 22 to Sunday, June 24

**DEPARTURE FROM:** Front entrance of the VCC (Burrard Street)

**DEPARTURE TIME:** 7:30

---

### **Geology and natural Hazards of the Sea-to-Sky Corridor**

---

**LOCATION:** Howe Sound, West Vancouver to Squamish, South-coastal British Columbia

**FIELD TRIP SPONSOR:** Geological Association of Canada

**CONTACTS:** John Clague

**DURATION:** 1 day – Friday, June 22, 2018

**DEPARTURE FROM:** Outside of the Pan Pacific Hotel

**DEPARTURE TIME:** 8:00

**RETURN TIME:** 17:30

---

Sponsor



# EARLY CAREER PROGRAM

The Early Career program is available for Post-secondary Students and Geoscientists in their first 15 years of professional practice, including postgraduate studies.



## PANEL DISCUSSIONS

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### The Changing World of Work

---

**DATE:** Tuesday, June 19

**TIME:** 13:30 - 17:00

**ROOM:** 210

**ORGANIZER:** Jennifer Wright, MiHR

View details under the technical program schedule - Education and Knowledge Theme.

---

### Natural Sciences and Engineering Research Council (NSERC) Information Session

---

**DATE:** Tuesday, June 19

**TIME:** 15:30 - 17:00

**ROOM:** 211

**PRESENTERS:** Tiffany Lancaster, NSERC Program Officer and Dr. Jacob Hanley, Associate Professor Department of Geology, Saint Mary's University

**DESCRIPTION:** Natural Sciences and Engineering Research Council (NSERC) staff, with members of the Geosciences Evaluation Group, will be holding an information session to discuss "Writing a Successful Discovery Grant – tips from the Geoscience Evaluation Group". There will also be an update on what is new at NSERC, with a focus on the Discovery Grant Program.

---

### Diversity in Earth Science and Resource Careers

---

**DATE:** Wednesday, June 20

**TIME:** 13:30 - 17:00

**ROOM:** 210

**ORGANIZERS:** Mona Forster, Libby Sharman and Kylie Williams

View details under the technical program schedule - Education and Knowledge Theme.

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### Believing the Power of Beauty: PNSO's Scientific Art Project "Stories on Earth" (2010-2070)

---

**WHEN:** Wednesday, June 20

**TIME:** 14:00 - 14:45

**PLACE:** Room 211

**PRESENTER:** Zhu Danqing, PNSO's Publicity Officer

Earth's history as a science, and story-telling as an art, are both heritages that humans should preserve for future generations. That is why we at PNSO refer to our work as "scientific art". Since our founding in 2010, PNSO has worked with the world's scientists to retell Earth's stories, primarily using fossils as a source of imagination, in the format of illustrations, paintings, sculptures, music, and videos. We review the work PNSO has done in the past eight years and present visions for our 60-year project plan. We invite scientists, artists, educators and others to work with PNSO in creating and promoting scientific art.

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We think of  
Sandhill Fen  
as a worthy  
show & tell.

In our quest to rebuild the landscape, we've engaged the best minds to understand how natural systems work and what it needs to thrive. Synchrude, together with academics from across North America, has reclaimed a former mine site. We now have a success story that's 62 football fields large, filled with plants and wildlife.

Learn more at our  
RFG 2018 presentation  
or [synchrude.ca](http://synchrude.ca)

**Synchrude**

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## Professional Reliance – Navigating the Professional Aspect of Your Career in Science

---

**DATE:** Thursday, June 21

**TIME:** 8:30 - 12:00

**ROOM:** 210

**ORGANIZER:** Lindsay Steele, Association of Professional Engineers and Geoscientists of BC

View details under the technical program schedule - Education and Knowledge Theme.

---

### Icebreaker

---

**WHEN:** Sunday, June 17, 17:00 to 20:00

**PLACE:** Early Career Lounge, Meeting Hub (Trade Show floor), Exhibit Hall

**PRICE:** Included with delegate registration.

Join your peers at the Early Career Delegates Lounge in the Exhibition Hall for an opportunity to mix and mingle at the opening night reception. Attend the opening ceremony in the Ballroom Foyer on level 1 at 16:30.

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### Meet the Plenary

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**DATE:** Monday, June 18

**TIME:** 12:00 - 12:45

**ROOM:** 210

By invitation only.

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### Lunchtime Workshops

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**DATE:** Monday, June 18 and Tuesday, June 19

**TIME:** 12:15 - 13:25

**ROOM:** 211

Included with delegate registration. First come, first served (bring your own lunch).

These 1-hour workshops will provide Post-Secondary Students and Early Career Delegates with an opportunity to discuss, explore, and navigate earth science and early career issues.

**Monday Workshop:** The Base Map for Shaping Your Geoscience Career  
Libby Sharman, Global Geoscientist at BHP, Elisa Scordo, Senior Hydrologist at BGC, Patrick McAndless, Professional Geologist at Geo-Dude Corner, Thomas Branson, Senior Geologist at Equity Exploration

**Tuesday Workshop:** Personal Branding: "Discovering Your Brand" and "Launching Your Brand"  
Patrick McAndless, P.Geo, FGC, Geodude Corner

---

### Career Speed Mentoring

---

**DATE:** Wednesday, June 20

**TIME:** 10:30 - 13:00

**ROOM:** 211

Selected participants only.

---

### Early Career Speaker Series/ Pop Up Talks

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**DATE:** Trade Show Hours

**ROOM:** Seequent - Booth 317, Exhibit Hall



Post-Secondary Students and Early Career Delegates are provided an opportunity to deliver a brief (2-3 min.) presentation and be filmed in a special competition run by our sponsor, Seequent.

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# EDUCATION, OUTREACH & YOUNG LEADERS

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## Resources for Future Generations Earthcache Exploration

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**WHEN:** Self-directed. Your choice.

**PLACE:** Vancouver area

**PRICE:** Free

The Resources for Future Generations 2018 EarthCache Program includes a series of twelve Vancouver area EarthCaches. Also recommended is a series of six EarthCaches, located along the scenic Sea to Sky Highway. Each individual cache may be uploaded to a handheld GPS or loaded via a GPX file. Please visit the RFG 2018 web site / Education-Outreach / Outreach Public Awareness for the complete program.

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## WHY on Earth Do You Care? Video Competition

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We know that every day, in their own way, young leaders are innovating, researching, and inspiring CHANGE that will lead to a sustainable future for the residents of planet earth. These are our EARTH CHAMPIONS. Now it's time to hear their stories... Stop at the Early Career Lounge on the trade show floor to watch the videos of the winners.



## TEACHERS' PROGRAM

These elements of the program are available to participants without the requirement of registering for the conference. To register, please visit [RFG2018.org](http://RFG2018.org) and click on Teacher's Program.

---

### Educators' Sea to Sky Geotour Field Trip

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**WHEN:** Sunday, June 17, 6:30 - 17:00

**PLACE:** Group meets at the RFG information desk in the registration area

---

### Earth Science Educator Professional Learning Workshop

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**WHEN:** Saturday, June 23, 9:00 to 15:00

**PLACE:** Simon Fraser University, Burnaby Campus, 8888 University Drive, Burnaby

**PRICE:** \$20

Join members of the Earth Science Education and Outreach Community for an interactive professional development workshop that focuses on hands on learning about the earth, minerals, water, and energy. The session will include opportunities for networking, discussions, resources for the classroom, and more! Lunch is included. To register, please visit [RFG2018.org](http://RFG2018.org) and click on Teachers' Program.



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## Taking People Further

From smart phones to schools, our mineral products are found in everything that makes modern life possible.

To learn more, visit [www.teck.com](http://www.teck.com)

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**Teck**

A photograph of a social event. In the foreground, a woman in a dark, sleeveless dress is performing on stage, holding a microphone. To her right, a man in a dark suit is also performing, holding a microphone. The stage is lit with blue and purple lights. In the background, a large crowd of people is dancing and socializing. The overall atmosphere is lively and festive.

# SOCIAL PROGRAM & PARTNER EVENTS

The Social Program Committee and various RFG partners have been hard at work to come up with an exceptional social program taking advantage of the many attractions and entertainment opportunities in and around Vancouver. Purchase Social and Partner Event tickets at any time through the online registration portal.

**A fun time is guaranteed.**



**SATURDAY, JUNE 16**

**North Shore Tour**

**TIME:** 9:00 to 14:00

**PRICE:** \$130. Lunch not included.

**PLACE:** Group meets at the RFG information desk in the registration area

**SUNDAY, JUNE 17**

**Sea to Sky Gondola**

**TIME:** 9:00 to 14:00

**PRICE:** \$125. Lunch not included.

**PLACE:** Group meets at the RFG information desk in the registration area

**SUNDAY, JUNE 17**

**Opening Celebration and Icebreaker Reception**

16:30-17:00

**OPENING CELEBRATION IN THE BALLROOMS FOYER**

Level 1

17:00-20:00

**ICEBREAKER RECEPTION**

Trade Show on the Exhibit Hall

Open to all registered participants. Complimentary drink ticket to registered delegates.

**Lunches from Monday to Wednesday**

Food concessions in the Exhibit Hall will offer a variety of lunch items for purchase daily. Having lunch on the Trade Show floor will help the RFG community network and get to the afternoon sessions on time.

Join your peers at the Early Career Delegates' Lounge in the Exhibit Hall for an opportunity to mix and mingle during the opening night ice breaker. First, attend the opening ceremony in the Ballroom Foyer on level 1 at 16:30.

**MONDAY, JUNE 18**

**GAC Awards Luncheon**

**TIME:** 12:00 to 13:30

**PRICE:** \$85 for Professionals. \$35 for Students.

**PLACE:** Room 306



**GEOLOGICAL  
ASSOCIATION OF CANADA  
ASSOCIATION  
GÉOLOGIQUE DU CANADA**

**Reception at the Trade Show (Meeting Hub)**

**TIME:** 15:30 to 17:00

**PLACE:** Meeting Hub (Trade Show floor), Exhibit Hall

**Complimentary drink ticket to registered delegates.**

## SOCIAL PROGRAM & PARTNER EVENTS

### MONDAY, JUNE 18

#### Student Pub Crawl

**TIME:** 19:00 to 21:00

**PRICE:** \$15 (Food & drinks not included)

**PLACE:** Group meets at the RFG information desk in the registration area

Explore Vancouver's night-life, network with new colleagues, and win prizes. Participant must be between 19 to 30 years old and are responsible for all beverages and food purchased during the event.

### TUESDAY, JUNE 19

#### MAC Awards Luncheon

**TIME:** 12:00 to 13:30

**PRICE:** \$85 for Professionals. \$35 for Students.

**PLACE:** Room 306



MINERALOGICAL  
ASSOCIATION OF CANADA  
ASSOCIATION  
MINÉRALOGIQUE DU CANADA

#### Reception at the Trade Show (Meeting Hub)

**TIME:** 15:30 to 17:00

**WHERE:** Meeting Hub (Trade Show floor), Exhibit Hall

**Complimentary drink ticket to registered delegates.**

#### RFG 2018 Movie Night

**VIEWING:** Konline

**TIME:** 18:30 to 21:00

**PRICE:** \$10. Includes admission and one refreshment.

**PLACE:** Ballroom A

Open to delegates, friends, family and public.



On Common  
Ground Consultants Inc.

### WEDNESDAY, JUNE 20

#### MDD Awards Luncheon

**TIME:** 12:00 to 13:30

**PRICE:** Professionals - \$85 | Students - \$35

**PLACE:** Room 306



#### Vancouver Art Gallery Tour

**TIME:** 19:00 to 21:00

**PRICE:** \$30

**PLACE:** Group meets at the RFG information desk in the registration area

WEDNESDAY, JUNE 20

AAG Gala dinner (at the Vancouver Aquarium)

**TIME:** Buses leave at 18:15 and 18:45

**PRICE:** \$120

**PLACE:** Group meets at the RFG information desk in the registration area



THURSDAY, JUNE 21

Vancouver Brewery & Distillery Tour

**TIME:** 18:30 to 22:00

**PRICE:** \$165

**PLACE:** Group meets at the RFG information desk in the registration area

**Did you know every solar panel produced requires:  
copper, coal, zinc and selenium?**

Join us at **Booth 615** to learn how we help customers produce these essential minerals.  
At Komatsu, we are revolutionizing mining for a sustainable future together.

**KOMATSU**



# Mineralogical Association of Canada Association minéralogique du Canada

## A w a r d M é d a i l l é s W i n n e r s 2018



Peacock Medal/Médaille Peacock

### Stearns A. Morse

The Peacock Medal is awarded to a scientist who has made outstanding contributions to the mineral sciences in Canada. There is no restriction regarding nationality or residency. The medal is intended to recognize the breadth and universality of these contributions in mineralogy, applied mineralogy, petrology, crystallography, geochemistry or the study of mineral deposits rather than in a narrow area of expertise.

The 2018 Peacock Medal has been awarded to Stearns A. Morse, Prof Emeritus at University of Massachusetts.



Young Scientist Award/Médaille des jeunes chercheurs

### Matthew Steele-McInnis

This award is given to a young scientist who has made a significant international research contribution in a promising start to a scientific career. The scientist must be a Canadian working anywhere in the world or a scientist of any nationality working in Canada. The research areas include mineralogy, crystallography, petrology, geochemistry, mineral deposits, and related fields of study.

The 2018 Young Scientist Award has been awarded to Matthew Steele-McInnis of the University of Alberta.



Hawley Medal/Médaille Hawley

### Gil F. Tansman, Paul S. Kindstedt, and John M. Hughes

For the best paper published in *The Canadian Mineralogist* in 2017

MINERALS IN FOOD: CRYSTAL STRUCTURES OF  
IKAITE AND STRUVITE FROM BACTERIAL SMEARS ON  
WASHED-RIND CHEESE

Can. Mineral. Vol. 55, pp. 89-100 (2017).



Join us at the MAC Luncheon for the Medals and Awards presentation

## MAC Awards Luncheon

### Dîner-causerie de l'AMC

Tuesday, June 19, 2018 – Mardi, 19 juin 2018, 12:00 – 13:30  
Vancouver Convention Center – Room #306

Don't miss our Medalists Lectures just prior to or after our Luncheon in Room #302

Young Scientist Medalist "Hydrothermal properties of geologic fluids: Causes and consequences" 11:30 – 12:00

Peacock Medalist "Gifts of a Lifetime in Earth Science"

13:30 – 14:00

The MAC Annual General Meeting will take place  
Tuesday, June 19, 2018 – Mardi, 19 juin 2018, 17:15 – 17:45  
Vancouver Convention Center – Room #304

All MAC members are invited; we hope to see you there!

We invite you to drop by our booth #400 located in exhibit hall

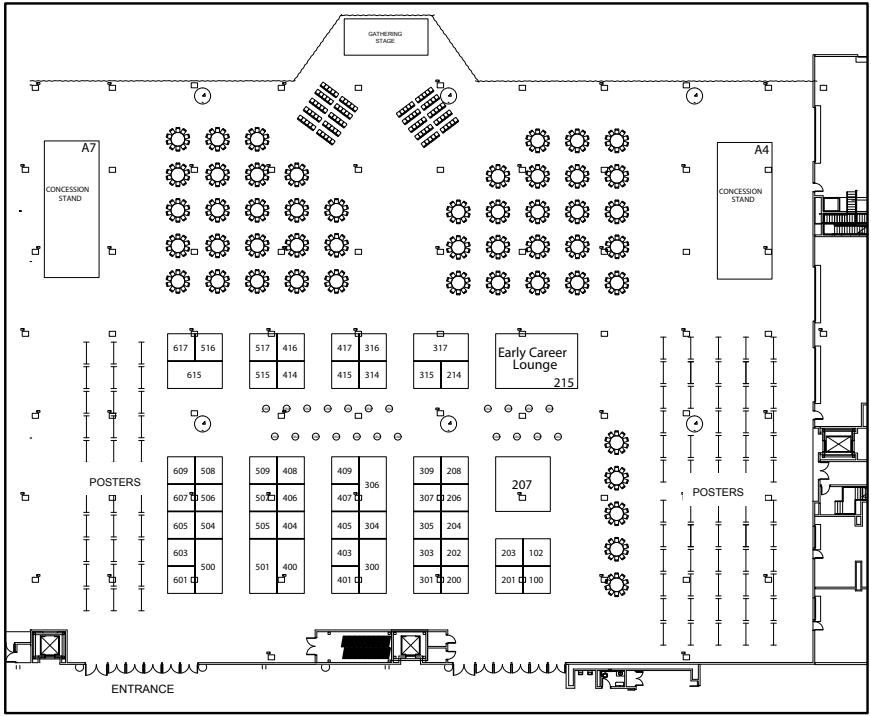
### Come and check our publications

- ◆ *The Canadian Mineralogist*
- ◆ Special Publications
- ◆ Topic in Mineral Sciences Volumes
- ◆ *Elements* – An International Magazine of Mineralogy, Geochemistry, and Petrology



[www.mineralogicalassociation.ca](http://www.mineralogicalassociation.ca)

# MEETING HUB FLOOR PLAN



- Trade Show
- Poster Session
- Early Career Lounge
- Innovation Stage - Monday
- Gathering Place - Tuesday
- Daily Networking Receptions
- Food Cash Concessions



# #RFG2018



## EXHIBITORS

- |           |  |           |   |
|-----------|--|-----------|---|
| Booth 300 | <b>36th International Geological Congress</b><br>36igc.org                       | Booth 403 | <b>Elements</b><br>elementsmagazine.org   |
| Booth 406 | <b>Activation Laboratories Ltd. (Actlabs)</b><br>actlabs.com                     | Booth 404 | <b>GAC-MAC-IAH/CNC Quebec 2019</b><br>gacmac-quebec2019.ca  |
| Booth 507 | <b>ALS Geochemistry</b><br>alsglobal.com/ca                                      | Booth 501 | <b>Geological Association of Canada</b><br>gac.ca   |
| Booth 409 | <b>American Geosciences Institute</b><br>americangeosciences.org                 | Booth 305 | <b>Irish Centre for Research<br/>in Applied Geosciences</b><br>icrag-centre.org                                   |
| Booth 505 | <b>Association of Applied Geochemists</b><br>appliedgeochemists.org              | Booth 500 | <b>Isomass Scientific Inc.</b><br>isomass.com   |
| Booth 315 | <b>BGC Engineering Inc.</b><br>bgcengineering.ca                                 | Booth 316 | <b>KEYENCE CANADA INC.</b><br>keyence.ca  |
| Booth 408 | <b>British Geological Survey</b><br>bgs.ac.uk                                    | Booth 615 | <b>Komatsu</b><br>mining.komatsu  |
| Booth 416 | <b>Bureau Veritas CC</b><br>bureauveritas.com/um                                 | Booth 206 | <b>LoCoSu project - Institute of Mineral<br/>Resources Engineering -<br/>RWTH Aachen University</b><br>locosu.org |
| Booth 304 | <b>Canadian Geoscience<br/>Education Network</b><br>earthsciencescanada.com/cgen | Booth 203 | <b>Malvern Panalytical</b><br>malvernpanalytical.com  |
| Booth 309 | <b>Canadian Institute of Mining,<br/>Metallurgy and Petroleum</b><br>cim.org     | Booth 400 | <b>Mineralogical Association of Canada</b><br>mineralogicalassociation.ca   |
| Booth 506 | <b>Canadian Science Publishing</b><br>cdnsciencepub.com                          | Booth 314 | <b>Ministry of Energy and Resources,<br/>Government of Saskatchewan</b><br>saskatchewan.ca                        |
| Booth 102 | <b>Canadian Trade Commissioner Service</b><br>international.gc.ca/gac-amc        | Booth 601 | <b>MS Analytical</b><br>msanalytical.net  |
| Booth 401 | <b>Corescan</b><br>corescan.com.au   | Booth 415 | <b>Olympus America Inc.</b><br>olympus-ossa.com   |
| Booth 215 | <b>Early Career Lounge / CGEN</b><br>earthsciencescanada.com                     |           |   |



- |           |   |           |   |
|-----------|---|-----------|---|
| Booth 609 | Ontario Geological Survey - Geoscience Laboratories<br>info.gov.on.ca/info/home.html#orgProfile/6908/en | Booth 306 | SciAps Inc<br>sciaps.com  |
| Booth 414 | Ore Research & Exploration - OREAS<br>ore.com.au  | Booth 317 | Seequent<br>seequent.com  |
| Booth 515 | Overburden Drilling Management Limited<br>odm.ca  | Booth 504 | SGS<br>sgs.ca   |
| Booth 605 | Pix4D<br>pix4d.com  | Booth 508 | SkyTEM Canada<br>skytem.com                                       |
| Booth 516 | Process Mineralogical Consulting Ltd.<br>processmineralogy.com  | Booth 204 | Society for Geology Applied to Mineral Deposits<br>e-sga.org/home |
| Booth 405 | Proto<br>protoxrd.com   | Booth 417 | Society of Economic Geologists<br>segweb.org                      |
| Booth 202 | Queen's University, Master of Earth and Energy Resources Leadership<br>queensu.ca/earthenergyleadership | Booth 201 | Teck Resources Limited<br>teck.com                                |
| Booth 200 | REFLEX<br>reflexnow.com   | Booth 301 | TerraCore<br>terracoregeo.com                                     |
| Booth 509 | Resources<br>mdpi.com/journal/resources   | Booth 303 | The Geological Society of America<br>geosociety.org               |
| Booth 207 | Rio Tinto<br>riotinto.com   | Booth 208 | The Geological Society of London<br>geolsoc.org.uk                |
| Booth 603 | Royal Roads University<br>royalroads.ca   | Booth 307 | the International Union of Geological Sciences<br>iugs.org        |
| Booth 214 | Saskatchewan Research Council<br>src.sk.ca  | Booth 517 | UBC - Master of Engineering Leadership<br>mel.ubc.ca              |
|           |   | Booth 407 | ZEISS Microscopy  |

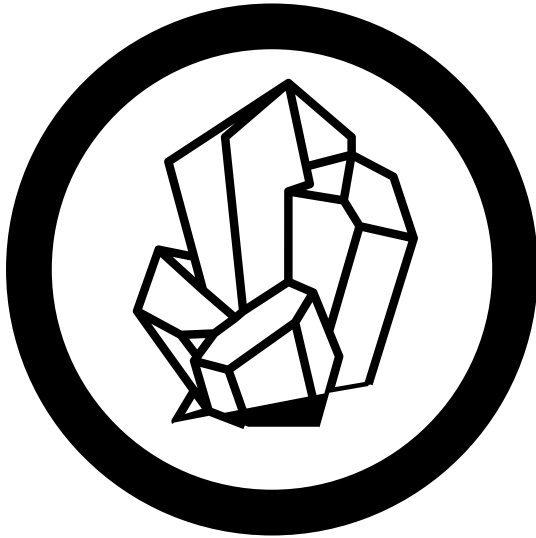


# TECHNICAL PROGRAM

The RFG2018 Organizing Committee would like to extend our heartfelt thanks to all of the volunteers who have worked tirelessly to make RFG2018 a reality. For the Technical Program, the Theme Leaders, Session Organizers and on-site Session Chairs are thanked for their generous contributions of time and expertise to create session topics, encourage abstract submissions, review both oral and poster abstracts, and organize and manage oral sessions. Without their efforts, we would not have been able to develop and deliver such a comprehensive and complete program.

Session Organizers and Chairs are listed in alphabetical order within each session.





TECHNICAL PROGRAM

# MINERALS



MONDAY, JUNE 18

MINERALS I	10:30 - 12:00	ROOM 109
<b>MIN28:</b>	<b>Micro- to Macro-Biogeochemistry: Exploration, Processing, Remediation and the Environment I (AAG: 28th IAGS)</b>	
<b>Organizers:</b>	Sean Crowe, University of British Columbia (UBC); Colin Dunn Consulting Inc.; Peter Winterburn, UBC	
<b>Chairs:</b>	Sean Crowe; Colin Dunn; Maarit Middleton, Geological Survey of Finland; Nathan Reid, Commonwealth Scientific and Industrial Research Organisation (CSIRO); Rachel Simister, UBC	
<b>10:30 - 2461</b>	<b>Microorganisms and Minerals: Opportunities and Challenges</b> Sean Crowe - University of British Columbia	
<b>10:45 - 2308</b>	<b>KEYNOTE: Undercover Investigations: Can Experimental Biogeochemistry Provide Important Clues to Vector Towards Buried Mineralization?</b> <i>David Fowle - University of Kansas</i>	
<b>11:15 - 2178</b>	<b>Responses of the Soil Microbial Community to Weathering of Ore Minerals</b> Rachel Simister, Bianca Lulianella-Phillips, Peter Winterburn and Crowe Sean - University of British Columbia	
<b>11:30 - 1832</b>	<b>Molecular Biology in Mineral Exploration</b> Bianca Patrizia Lulianella Phillips, Rachel Simister, Peter Winterburn and Sean Crowe - University of British Columbia	
<b>11:45 - 2467</b>	<b>Microbial Communities in Exposed Soils from Hydraulic Fracturing Sites</b> Jennifer Spence, Reilly Ische, Michael Bilek, Nikolaus Finke, Faride Unda, Rachel Simister, Shawn Mansfield and Sean Crowe - University of British Columbia	

MINERALS II	10:30 - 12:00	ROOM 110
<b>MIN3:</b>	<b>Ore Deposit Models</b>	
<b>Organizer:</b>	David Broughton, Kaizen Discovery Inc.	
<b>Chair:</b>	David Lefebure, Lefebure GeoLogic Ltd.	
<b>10:30 - 2381</b>	<b>Mineral Deposit Models – Evolving to Marry Human Knowledge and Artificial Intelligence</b> David V. Lefebure and Clinton Smyth - Minerva Intelligence Inc.	
<b>10:45 - 2102</b>	<b>Fluids are Bound to be Involved in the Formation of Ophiolitic Chromite Deposits</b> Robert F. Martin - McGill University; Zdenek Johan - French Geological Survey; Vojtech; Ettler - Charles University	
<b>11:00 - 1891</b>	<b>The Extraordinary Ore Geochemistry of the Neves-Corvo VMS Deposit, Iberian Pyrite Belt</b> Jorge M.R.S. Relvas - University of Lisbon; João R.S. Carvalho - Sustainable Innovation Centre, Portugal; Álvaro M.M. Pinto - University of Lisbon; Max Frenzel - Helmholtz-Zentrum Dresden-Rossendorf; Nelson Pacheco and Paulo C. Noiva - Somincor - Lundin Mining, Neves-Corvo Mine	
<b>11:15 - 2366</b>	<b>A New World Class Nickel Resource with Low Environmental Impact</b> John C. Barr - AngloAmerican; Trevor Rabb - Equity Exploration	

11:30 - 1738 **Hydrothermal and Structural Control on the Co-Ni Arsenide Mineralisation at the Bou Azzer Deposit, Morocco**  
 Enora Tourneur and Alain Chauvet - Université de Montpellier;  
 Kalin Kouzmanov - University of Geneva; Johann Tuduri - French Geological Survey;  
 Stanislas Sizaret - Institut des Sciences de la Terre d'Orléans; Abdelhak Karfal,  
 Younes Moundi, Mohamed El Hassani, Aomar Ennaciri and Lhou Maacha - Managem  
 Group and CTT

11:45 - 1288 **Mesozoic Cu-polymetallic Mineralization in South China**  
 Xiaofeng Li - Chinese Academy of Sciences

**MINERALS III 10:30 - 12:00 ROOM 111**

MIN39: **Geoenvironmental Characteristics of Critical Metal Deposits I**  
**Organizers** Rory Cameron, CanmetMINING; Heather Jamieson, Queen's University; Michael Parsons,  
**and Chairs:** Geological Survey of Canada; Robert Seal, U.S. Geological Survey

10:30 - 1267 **KEYNOTE: Mine Wastes of Critical Metals: Current Knowledge and Future Directions**  
*Karen Hudson-Edwards - University of Exeter; Heather Jamieson - Queen's University*

11:00 - 2261 **Applications of Automated Mineralogy into the Environmental Geometallurgy of Critical Element Deposits**  
 Tassos Grammatikopoulos and Stephanie Downing - SGS Canada

11:15 - 1759 **Contrasting Environmental Characteristics of Primary and Byproduct Critical Element Deposits From the Perspective of Mill Tailings**  
 Robert R. Seal and Nadine Piatak - U.S. Geological Survey

11:30 - 1527 **Mobility of REE in Tailings from the Proposed Nechalacho Mine, NWT**  
 Heather Jamieson and Colin Purdy - Queen's University

11:45 - 2419 **Waste and Low-Grade Ore Characterization and Classification (Using Machine Learning): Proposed Bear Lodge Project REE Mine, WY, USA**  
 Tom Meuzelaar, Morgan Warren and Rens Verburg - Golder Associates, Inc.

**MINERALS IV 10:30 - 12:00 ROOM 114**

MIN54: **Applied Mineralogy in the Mining Industry - Integration, Applications and Future Development**  
**Organizers:** Eimear Deady, British Geological Survey and University of Exeter; Hannah Hughes,  
 University of Exeter; Katie McFall, Cardiff University  
**Chair:** Eimear Deady; Holly Elliott, University of Exeter

10:30 - 1817 **Multi-Scale, Multi-Modal and Multi-Dimensional Analysis – Ideas Borrowed from the Oil Industry But Now A Reality For The Mining Sector**  
 Alan R. Butcher - Geological Survey of Finland; Gavyn Rollinson - University of Exeter;  
 Sayab Mohammad and Peter Sorjonen-Ward - Geological Survey of Finland

10:45 - 1558 **A New Paradigm for Automated Mineralogy to Deliver Increased Ore Deposits Knowledge – Recent Developments and a View Towards the Future**  
 Shaun David Graham - Carl Zeiss

11:00 - 1964 **Probing Mining Industry Questions Using Synchrotron Spectroscopy**  
 Neil Banerjee - Western University; Lisa Van Loon - LISA CAN Analytical Solutions Inc.

11:15 - 2114 **Gold deportment in mill tailings: A new approach in applied mineralogy**  
 Jonathan Tremblay, Réjean Girard and Alexandre Neron - IOS Services Geoscientifiques Inc.;  
 Raphael Mermillod-Blondin and Yanick Bergeron - Agnico Eagle Mines Limited


**MONDAY, JUNE 18**

- 11:30 - 1722 **Assessing the Distribution of Accessory Bismuth Mineralisation in the Tungsten-Tin Granite-Greisen Systems Of South West England**  
Eimear Deady - University of Exeter and British Geological Survey; Kathryn Moore - University of Exeter; Kathryn Goodenough - British Geological Survey
- 11:45 - 2338 **Using Fenite as an Exploration Indicator for Ree-Enrichment in Carbonatite Complexes**  
Holly Anne Lydia Elliott, Frances Wall and Sam Broom-Fendley - University of Exeter

**MINERALS V**
**10:30 - 12:00**
**ROOM 115**

- MIN38: Recent Advances in the Study of Platinum Group Elements and Ultramafic Rocks I**  
**Organizers:** James Brenan, Dalhousie University; Jacob Hanley, Saint Mary's University; Andy McDonald, Laurentian University; James Mungall, Carleton University  
**Chairs:** Jacob Hanley; Dejan Milidragovic, BC Geological Survey; James Mungall; Graham Nixon, BC Geological Survey
- 10:30 - 1175 **KEYNOTE: Global Platinum Group Element Resources, Reserves and Mining – A Critical Assessment**  
Simon Jowitt - University of Nevada, Las Vegas; Gavin Mudd and Tim Werner - RMIT University
- 11:00 - 2383 **Compatible-Incompatible Element Dynamics in Cr-Fe-Ti-V-PGE-Ni-Cu Deposit Families: Genetic and Applied Aspects**  
Igor Avgustinchik - Moscow Geological Prospecting College
- 11:15 - 2057 **Detrital Platinum-Group Minerals from Till Samples: Mineralogy, Evolution and their Use as Exploration Tool**  
Philippe Pagé, Réjean Girard and Jonathan Tremblay - IOS Services Géoscientifiques Inc.
- 11:30 - 1504 **KEYNOTE: Role of Xenophases in the Genesis of Ni-Cu-PGE Mineralization Associated with Ultramafic-Mafic Magmas**  
C. Michael Leshner - Laurentian University

**MINERALS VI**
**10:30 - 12:00**
**ROOM 116**

- MIN50: Mineral Prospectivity Modeling and Assessment of Undiscovered Mineral Resources I**  
**Organizers:** John Carranza, University of KwaZulu-Natal; Jeff Harris, Geological Survey of Canada; Vesa Nykänen, Geological Survey of Sweden; Renguang Zuo, China University of Geosciences  
**Chairs:** John Carranza; Vesa Nykänen; Mana Rahimi, University of British Columbia; Renguang Zuo
- 10:30 - 2330 **Eastern Mindanao Philippines: Au-Cu Hydrothermal Deposits and their Spatial Relation to Faults/Fractures**  
Darwin Edmund Lumaban Riguer and Carlito Ausa - Apex Mining Co., Inc.; Hernulfo Ruelo - GTS Consultants; Emmanuel John Carranza - University of KwaZulu-Natal
- 10:45 - 1693 **Quantitative Structural Analysis of Ore Field by Gis-Based Methods**  
Wenlei Wang - Chinese Academy of Geological Sciences; Jie Zhao and Qiuming Cheng - China University of Geosciences, Beijing
- 11:00 - 1323 **Integrating Geochemistry and Gamma-Ray Surveys for Ree Targeting – A Case Study of Ouro Fino Intrusive Suite**  
*Tiago Buch, Guilherme Ferreira da Silva, Wilson de Oliveira Neto and Lucy Takehara Chemale - Brazilian Geological Survey*

**MONDAY, JUNE 18**

**11:15 - 1715** **A Novel Approach Combining Geomagnetic and Hyperspectral Drone-Borne Data. Advances In Remote Sensing Based Mineral Exploration**  
Robert Jackisch, Robert Zimmermann and Sandra Lorenz - Helmholtz-Zentrum Dresden-Rossendorf (HZDR); Ari Saartenoja and Markku Pirttijärvi - Radai Oy; Richard Gloaguen - HZDR

**11:30 - 1253** **Processing Regional Stream Sediment Data for Mineral Exploration Targeting**  
Dennis Arne - Telemark Geosciences; Rob Mackie, Chris Pennimpe and Eric Grunsky - CSA Global

**11:45 - 1141** **Geochemical Mineral Exploration: Focusing on Negative Geochemical Anomalies**  
Renguang Zuo - China University of Geosciences; Emmanuel John Carranza - University of KwaZulu-Natal

**MINERALS VII 10:30 - 12:00 ROOM 117**

**MIN41:** **Ensuring the Supply of Critical Materials to Meet the UN 2030 Sustainable Development Goals**

**Organizers:** Damien Giurco, University of Technology Sydney; Lawrence Meinert, Colorado School of Mines; Gavin Mudd, RMIT University; Edmund Nickless, International Union of Geological Sciences (IUGS)

**Chair:** Lawrence Meinert

**10:30 - 2292** **KEYNOTE: Critical Materials for Future Generations**  
Lawrence Meinert - Colorado School of Mines

**11:00 - 1703** **KEYNOTE: Material Supply for Sustainable Development – Navigating Disruptive Change**  
Damien Giurco - University of Technology Sydney

**11:30 - 1290** **Critical Path: Is Technology Metal Supply an Opportunity or a Threat to Achieving the Un Sustainable Development Goals in Developing Countries?**  
Andrew John Bloodworth, Kathryn Goodenough and Joseph Mankelov - British Geological Survey

**11:45 - 2004** **Critical Commodities: Australia's Opportunity as a Global Supplier**  
David Huston and Roger Skirrow - Geoscience Australia; Carl Brauhart - University of Western Australia

**MINERALS I 13:30 - 15:00 ROOM 109**

**MIN28:** **Micro- to Macro-Biogeochemistry: Exploration, Processing, Remediation and the Environment II (AAG: 28th IAGS)**

**Organizers:** Sean Crowe, University of British Columbia (UBC); Colin Dunn Consulting Inc.; Peter Winterburn, UBC

**Chairs:** Sean Crowe; Colin Dunn; Maarit Middleton, Geological Survey of Finland; Nathan Reid, Commonwealth Scientific and Industrial Research Organisation (CSIRO); Rachel Simister, UBC

**13:30 - 1940** **KEYNOTE: Halogens as Possible Pathfinders to Blind Mineralization: Examples from Lara and Mount Washington on Vancouver Island, British Columbia**  
David Heberlein - Heberlein Geoconsulting; Colin Dunn - Colin Dunn Consulting Inc.

**14:00 - 1207** **KEYNOTE: Biogeochemistry as a Regional Sampling Tool to Explore through the Eucla Basin**  
Nathan Reid, Ryan Noble and David Cole - Commonwealth Scientific and Industrial Research Organisation (CSIRO); Carmen Krapf - Geological Survey of South Australia; Ignacio Gonzalez-Alvarez, Ian Lau, Jess Robertson and Tenten Pinchand - CSIRO


**MONDAY, JUNE 18**

- 14:15 - 1181 **Biogeochemical Exploration of Mo and Pb Deposits in Norway**  
Belinda Flem, Clemens Reimann, Espen Torgersen, Malin Andersson, Tor Erik Finne and Ola Eggen - Geological Survey of Norway; Peter Englmaier - University of Vienna
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- 14:30 - 2179 **The Geochemical Signal for Airborne Plant Particulates and their Use for Mineral Exploration**  
John C. Barr - AngloAmerican
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- 14:45 - 2081 **Application of Synchrotron Spectroscopy to Environmental Monitoring and Biogeochemical Exploration: An Example from Seaweed in Howe Sound**  
Lisa Van Loon - LISA CAN Analytical Solutions Inc.; Neil Banerjee - Western University; Colin Dunn - Colin Dunn Consulting Inc.

**MINERALS II** **13:30 - 15:00** **ROOM 110**

- MIN4:** **Multiparameter Integrated Footprints of Mineral Systems**  
**Organizers:** Alan Galley, Canada Mining Innovation Council; Mark Hannington, University of Ottawa; Michael Leshner, Laurentian University  
**Chair:** Michael Leshner
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- 13:30 - 1874 **KEYNOTE: Integration of Multiple Datasets for the Highland Valley Copper Porphyry Deposit and Guichon Creek Batholith, South-Central British Columbia**  
Robert George Lee - University of British Columbia (UBC); Julia King - Geoscience North; Marc Vallée - Memorial University of Newfoundland; Guillaume Lesage - UBC; Kevin Byrne - University of Alberta; Craig J.R. Hart - UBC; Pete Hollings - Lakehead University; Sarah A. Gleeson - Helmholtz Centre GFZ Potsdam; Rachel Chouinard - UBC; Michael D'Angelo - Lakehead University; Philip Lypaczewski - University of Alberta
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- 14:00 - 2012 **The Valeriano Porphyry Copper Deposit Revisited: 3D Geological and Geochemical Integration and Characterization**  
McLean Trott - First Quantum Minerals Ltd.; Carlos Munchmeyer - Contract Geologist; Cristobal Valenzuel - Quantum Pacific Exploration Chile Ltd.
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- 14:15 - 2030 **Footprint Recognition and Prediction of Orogenic Gold Deposit at Regional Scale: A Comparative Study Between Bayesian Logics (Hypercube) And Wofe**  
Clement Dombrowski and Réjean Girard - IOS Services Geoscientifiques Inc.
- 
- 14:30 - 1407 **LREE-Rich Epidotes and Fluorocarbonates in the Canadian Malartic District, Canada: Toward New Indicator Minerals for Intrusion-Related Gold Deposits**  
Stephane Perrouy - Laurentian University; Robert L. Linnen - Western University; Iain M. Samson - University of Windsor
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- 14:45 - 1592 **Screening Background Signals from Ore Deposit Footprints with La-Icpms Mineral Trace Element Data**  
Matthew J. Cracknell, Michael Baker and David Cooke - University of Tasmania

**MINERALS III** **13:30 - 15:00** **ROOM 111**

- MIN39:** **Geoenvironmental Characteristics of Critical Metal Deposits II**  
**Organizers and Chairs:** Rory Cameron, CanmetMINING; Heather Jamieson, Queen's University; Michael Parsons, Geological Survey of Canada; Robert Seal, U.S. Geological Survey



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- 13:30 - 1919 Drainage Water Quality from REE-Bearing Mine Wastes: Geochemical Characterization and Kinetic Test Results from the Kipawa and Montviel Deposits**  
Mohamed Edahbi, Benoît Plante and Mostafa Benzaazoua - Université du Québec en Abitibi-Témiscamingue (UQAT); Mia Pelletier - GéoMégA Ressources Inc.; François Biron - Matamec Explorations Inc.
- 13:45 - 1275 Environmental Signature of Mine Wastes and Waters at a Carbonatite-Hosted Niobium and Rare Earth Element Deposit in Oka, Quebec**  
Michael B. Parsons, Jeanne Percival, Katherine Venance and Alexandre Desbarats - Geological Survey of Canada
- 14:00 - 1570 Environmental Characterization of Waste Rock and Tailings from a Carbonatite-Hosted Niobium and Rare Earth Element Deposit**  
Sean Des Roches - Queen's University; Micheal Parsons - Geological Survey of Canada (GSC); Heather Jamieson - Queen's University; Jeanne B. Percival - GSC
- 14:15 - 1451 The Biogeochemistry of Indium, Gallium, and Germanium in Mine Wastes**  
Sarah Jane White - U.S. Geological Survey; Laurel Schaidler - Silent Spring Institute; James Shine - Harvard T.H. Chan School of Public Health; Nadine Piatak, Ryan McAleer and Robert Seal - U.S. Geological Survey
- 14:30 - 2364 Demand for Critical Metals: Geo-environmental Considerations for the Potential for Renewed Mining in Cobalt, Ontario**  
Jeanne B. Percival - Geological Survey of Canada; Charles Dumaresq - The Mining Association of Canada
- 14:45 - 2501 Surface Water Chemistry of a Natural Wetland Established on Historic Mine Tailings at North Cobalt, Ontario (with an emphasis on cobalt)**  
Anthony Story and Maria Story - Story Environmental Inc.; Chris Kennedy - Agnico Eagle Mines Limited
- 15:00 - 1528 Controls on the Mobility of Antimony in Mine Waste from Three Deposit Types**  
Heather Jamieson, Anežka Radková and Skya Fawcett - Queen's University

MINERALS IV	13:30 - 15:00	ROOM 114
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| <b>MIN65:</b>       | <b>Industrial Minerals for a Prosperous Future for All</b>  |
| <b>Organizers:</b>  | Greg Dipple, University of British Columbia; David Manning, Newcastle University  |
| <b>Chair:</b>       | David Manning   |
| <b>13:30 - 1522</b> | <b>Future Prospects for Industrial Minerals – An Academic Perspective</b><br>David Manning - Newcastle University   |
| <b>13:45 - 1447</b> | <b>Unit Values of Mineral Property Transactions In Canada, USA, Mexico, Central America and South America, 2007-2017</b><br>Hrayr Agnerian - Agnerian Consulting Ltd.                 |
| <b>14:00 - 1166</b> | <b>Organic Rock Phosphate for Sustainable Farming</b><br>Johan Shearer - Fertoz International Inc.  |
| <b>14:15 - 1427</b> | <b>Potassium Fertilisers and Development: Review of Major Approaches to Improve Supply</b><br>Natalia Yakovleva, David Manning and Oliver Heidrich - Newcastle University             |
| <b>14:30 - 1161</b> | <b>Exploration Procedure for Potash Resource Confirmation and Mining Integrity Data - The Burr Potash Project, Saskatchewan, Canada</b><br><i>Dawn Zhou - CSIT Group of Companies</i> |
| <b>14:45</b>        | <i>Panel Discussion</i>   |



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MINERALS V	13:30 - 15:00	ROOM 115
<b>MIN38:</b>	<b>Recent Advances in the Study of Platinum Group Elements and Ultramafic Rocks II</b>	
<b>Organizers:</b>	James Brenan, Dalhousie University; Jacob Hanley, Saint Mary's University; Andy McDonald, Laurentian University; James Mungall, Carleton University	
<b>Chairs:</b>	Jacob Hanley; Dejan Milidragovic, BC Geological Survey; James Mungall; Graham Nixon, BC Geological Survey	
<b>13:30 - 1835</b>	<b>Where are the Missing Pge in Arc Magmatic-Hydrothermal Systems?</b> James Mungall - Carleton University; Sabastien Dyer and Zoltan Zajacz - University of Toronto; Richard Arculus - Australian National University	
<b>13:45 - 1339</b>	<b>Ultramafic Magmatism in Arc Settings: Revisiting The Picritic Rocks of the Southern Quesnel Terrane</b> Dejan Milidragovic - BC Geological Survey	
<b>14:00 - 2421</b>	<b>Melt Inclusions in Ultramafic Potassic Rocks in the Canadian Cordillera: A Record of the Transfer of PGE from Mantle to Crust in Porphyry Settings</b> Jacob Hanley - Saint Mary's University; Zoltan Zajacz - University of Toronto	
<b>14:15 - 1070</b>	<b>Platinum Mineralisation in the Owendale Ural-Alaskan-Type Complex, New South Wales, Australia: The Effects of Serpentinisation on Cu-Pge-Ni Sulfides</b> Reid R. Keays - Monash University; David Holwell - University of Leicester; Hazel Prichard - Cardiff University	
<b>14:30 - 1075</b>	<b>Genesis of a New Deposit Type - Disseminated Awaruite (Ni<sub>3</sub>Fe) Mineralization Hosted in the Cache Creek Terrane</b> <i>Ron Britten - First Point Minerals Corporation</i>	
<b>14:45 - 1177</b>	<b>Lateritic Pt-Sc-Co-Ni Mineralisation Produced from the Ultramafic Rocks of the OwendaleUrals-Alaskan-Type Complex, New South Wales, Australia</b> Reid R. Keays - Monash University	

MINERALS VI	13:30 - 15:00	ROOM 116
<b>MIN25:</b>	<b>Exploration Case Studies - Out of the Box Concepts, Methodologies and Practices I (AAG: 28th IAGS)</b>	
<b>Organizers:</b>	John Barr, AngloAmerican; Peter Bradshaw, FPX Nickel; Peter Winterburn, University of British Columbia	
<b>Chairs:</b>	Tim Baker, Eldorado Gold; John Barr; Peter Bradshaw; David Heberlien, Heberlien Geoconsulting; Barry Smee, Smee & Associates Consulting Ltd.; Ron Yehia, MYAR Consulting	
<b>13:30 - 1780</b>	<b>KEYNOTE: Application of aiSIRIS® Processed Spectral Data in Porphyry-Epithermal Systems from Early Stage Exploration to Mine Resource Evaluation</b> Timothy Baker and Sean Mckinley - Eldorado Gold Corp	
<b>14:00 - 2051</b>	<b>Case Studies in Advancing Model Driven Greenfield Exploration Projects</b> Charles Walter Funk - Evrim Resources	
<b>14:15 - 1330</b>	<b>Re-examining Brownfield Mining Districts in the Discovery of New Resources for Future Generations: Case History - The Dolly Varden Silver Mining Camp, British Columbia, Canada</b> Ben Whiting and Rob van Egmond - The Belcarra Group	



**MONDAY, JUNE 18**

**14:30 - 1032 Rapid Field Hydrogeochemistry Part II: Focus on Mineral Exploration Methodology - Results and Lessons from Two Surveys in Southern BC 2015-2017**  
Ron Yehia - MYAR Consulting; Ray E. Lett - Geochemist; Dave Heberlein - Heberlein Geoconsulting

**14:45 - 1091 The Amaruq Satellite Deposit – From a Grassroots Discovery to Agnico Eagle's Near-Term Future In Nunavut**  
Olivier Cote-Mantha, Guy Gosselin, Denis Vaillancourt and Alain Blackburn - Agnico Eagle Exploration

**MINERALS VII 13:30 - 15:00 ROOM 117**

**MIN41: Ensuring the Supply of Critical Materials to Meet the UN 2030 Sustainable Development Goals II**

**Organizers:** Damien Giurco, University of Technology Sydney; Lawrence Meinert, Colorado School of Mines; Gavin Mudd, RMIT University; Edmund Nickless, International Union of Geological Sciences (IUGS)

**Chair:** Lawrence Meinert

**13:30 - 2229 KEYNOTE: Metal Scarcity: Imminent Threat, Eternal Problem or Red Herring?**  
Rene Kleijn and Ester van der Voet - Leiden University

**14:00 - 2214 Rhenium: A Detailed Analysis of Mines and Mineral Resources**  
Tim Tyson Werner and Gavin Mudd - RMIT University;  
Simon Jowitt - University of Nevada, Las Vegas

**14:15 - 1326 Beryllium Material Flow Analysis and Future Availability**  
Graham William Lederer, Brian Jaskula, Nora Foley and Robert Ayuso - U.S. Geological Survey

**14:30 - 2263 From the Outside In: The Geopolitical Supply Risk Method for Raw Material Criticality Assessment on a Product-Level**  
Steven Young and Alex Cimprich - University of Waterloo; Christoph Helbig, Axel Tuma and Andrea Thorenz - University of Augsburg; Eskinder Gemechu - University of Alberta; Guido Sonnemann - University of Bordeaux

**14:45 - 1356 The Smelter/Refinery Bottleneck in Resilient Metal Supply Chains**  
Steven Young, Michael Wood, Shannon Fernandes and Yilun Na - University of Waterloo

**MINERALS I 15:30 - 17:00 ROOM 109**

**MIN28: Micro- to Macro-Biogeochemistry: Exploration, Processing, Remediation and the Environment III (AAG: 28th IAGS)**

**Organizers:** Sean Crowe, University of British Columbia (UBC); Colin Dunn Consulting Inc.; Peter Winterburn, UBC

**Chairs:** Sean Crowe, Colin Dunn; Maarit Middleton, Geological Survey of Finland; Nathan Reid, Commonwealth Scientific and Industrial Research Organisation (CSIRO); Rachel Simister, UBC

**15:30 - 1474 KEYNOTE: Biogeochemical Anomaly Detection for Target Scale Mineral Exploration in Northern Finland**

Maarit S. Middleton - Geological Survey of Finland; Dominika Miksova and Irene Hoffmann - Vienna University of Technology; Johanna Torppa and Raimo Sutinen - Geological Survey of Finland; Peter Filzmoser - Vienna University of Technology


**MONDAY, JUNE 18**

**16:00 - 2334**    **Geochemical Anomalies Above the Buried Garden Well Gold Deposit, Western Australia**  
Melvyn Lintern, Ravi Anand and Nathan Reid - Commonwealth Scientific and Industrial Research Organisation (CSIRO)

**16:15 - 2470**    **Biogeochemical Mapping At Various Scales Using fpXRF**  
David Cohen and Juee Vohra - University of New South Wales; Kiah Ostowari - Lendlease; Madeline Rincheval - Sydney Water; Emma Cohen - Saracen; Joe Schifano - GeoJoe; Andreas Zissimos - Geological Survey Department, Republic of Cyprus

**MINERALS II**
**15:30 - 17:00**
**ROOM 110**

**MIN8:**            **Bridging the Discovery Gap - Providing the Exploration Industry More Effective Area Selection Tools**

**Organizers:**    Harold Gibson and Ross Sherlock, Laurentian University

**Chair:**            Ross Sherlock

**15:30 - 1751**    **Mapping the Whole Lithosphere: Uncovering Metallogenic Truths**  
Graham Begg - Minerals Targeting International PL; William Griffin and Suzanne O'Reilly - Macquarie University; Jon Hronsky - Western Mining Services PL; Lev Natapov - Macquarie University

**15:45 - 1908**    **Metal Earth: Improved Prediction of Metal Endowment**  
Ross Sherlock and Harold Gibson - Laurentian University

**16:00 - 1951**    **Isotopic Terrane Mapping and Intra-Cratonic Architecture: The Underlying Control on all Mineral Systems?**

David Robert Mole, Phillips Thurston and Harold Gibson - Laurentian University

**16:15 - 1856**    **Metal Earth: A Multidisciplinary Ore Deposit Research Project to Improve our Understanding of Metal Endowment in Precambrian Rocks**  
Esmaeil Eshaghi, Rasmus Haugaard, Taus Jørgensen, Xiaohui Zhou, Harold L. Gibson, Ross Sherlock, Bruno Lafrance, John Ayer, Phil C. Thurston and Richard Smith - Laurentian University

**16:30 - 1081**    **Enhanced Bandwidth in Seismic and Magnetotelluric Exploration for Minerals**  
David B. Snyder - Laurentian University

**16:45 - 2249**    **Geoscience BC's TREK and Search Projects: Modern Data that Inspires Exploration and Informs Planning**  
Bruce Madu - Geoscience BC

**MINERALS III**
**15:30 - 17:00**
**ROOM 111**

**MIN26:**            **Towards Big Data: Applications of Data Analytics in Geochemistry I (AAG: 28th IAGS)**

**Organizers:**    Eric Grunsky, Consultant; Pim van Geffen, Vancouver Geochemistry; Peter Winterburn, University of British Columbia

**Chairs:**            Britt Bluemell, Bonanza Geosciences; Eric Grunsky; David Lawie, IMDEX, Australia; Samantha Scher, Corescan, Chile; Cliff Stanley, Acadia University; Pim van Geffen

**15:30 - 2215**    **KEYNOTE: Sorting the Signal from the Noise – Analytics In the Geosciences**  
David Lawie - IMDEX, Australia

**16:00 - 1133**    **Metrics and Methods for Predictive Geologic Mapping and Mineral Systems from Geochemical Survey Data**  
Eric Grunsky - China University of Geosciences and University of Waterloo

**16:15 - 2500**    **Adding Value to Regional Till Geochemical Data in Central BC through Exploratory Data Analysis**  
Britt Bluemell - Bonanza Geosciences

- 16:30 - 2076 **Comparison of Regional and Detailed Lake Sediment Geochemical Surveys in Ontario and Their Relevance to Mineral Exploration**  
Richard Dyer - University of Toronto
- 16:45 - 2045 **Domaining Hyperspectral Mineralogy and Geochemistry to Characterize Gold Recovery at Alturas Deposit, El Indio Belt, Chile**  
Carmina O. Jorquera - Barrick Gold; Samantha Scher - Corescan

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**MINERALS IV** **15:30 - 17:00** **ROOM 114**

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- MIN12: Natural Resources at Terrestrial Impact Structures**  
**Organizers:** Richard Grieve, Geological Survey of Canada, Gordon Osinski, University of Western Ontario  
**Chair:** Gordon Osinski
- 15:45 - 1756 **An Investigation of Hydrothermal Carbonate and Quartz Using Combined Microanalysis and Cathodoluminescence at the Haughton Impact Structure**  
Cassandra Lorraine Marion, Gordon R. Osinski and Robert L. Linnen - University of Western Ontario
- 16:00 - 2413 **The Hydrothermal System of the East Clearwater Lake Impact Structure**  
Derek King and Gordon Osinski - University of Western Ontario
- 16:15 - 2054 **Sulfide Vein Emplacement Mechanisms at the Broken Hammer Deposit: Sudbury, Canada**  
Marshall Hall, Bruno Lafrance and Harold Gibson - Laurentian University
- 16:30 - 1850 **Cathodoluminescence And Trace-Element Chemistry Of Quartz From Sudbury Offset Dykes**  
Elliot Andrew Wehrle and Andrew McDonald - Laurentian University
- 16:45 - 2210 **Stable Cu, Fe, and Ni Isotopic Systematics of the Sudbury Offset Dikes and Associated Rocks**  
Peter Christoffersen, Audrey Bouvier and Gordon Osinski - University of Western Ontario; Bastian Georg - Trent University; Shui-Jiong Wang and Laura Wasylenki - Indiana University

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**MINERALS V** **15:30 - 17:00** **ROOM 115**

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- MIN38: Recent Advances in the Study of Platinum Group Elements and Ultramafic Rocks III**  
**Organizers:** James Brenan, Dalhousie University; Jacob Hanley, Saint Mary's University; Andy McDonald, Laurentian University; James Mungall, Carleton University  
**Chairs:** Jacob Hanley; Dejan Milidragovic, BC Geological Survey; James Mungall; Graham Nixon, BC Geological Survey
- 15:30 - 2288 **KEYNOTE: Geochronology of Mafic Magmas of The Coldwell Complex, Midcontinent Rift, and Age Constraints on Magma Evolution in Relation to Cu-Pge Mineralization**  
David J. Good - Western University; Greg Dunning - Memorial University of Newfoundland
- 15:45 - 1456 **On the Controls Of Low- and High-Cu/Pd Mineralization in the Eastern Gabbro, Canada: Evidence from Sulfide Textures and Chemistry**  
Matthew Brzozowski, Iain Samson and Joel Gagnon - University of Windsor; David Good and Robert Linnen - Western University
- 16:00 - 2395 **New Pd-Ge and Rh-Ni-S Minerals from the Marathon Cu-Pd Deposit, Coldwell Complex, Ontario, Canada: Crystal Chemistry and Genetic Implications**  
Andrew M. McDonald - Laurentian University; Doreen Ames - Geological Survey of Canada; Ingrid Kjarsgaard - Consulting Mineralogist; David Good - Western University
- 16:15 - 1785 **Correlating the PGE-Rich Reefs of the Western and Eastern Bushveld Complex with the Platreef on the Northern Limb**  
Kate Jillings, Wolfgang D. Maier and Marc-Alban Millet - Cardiff University; Edward M. Ripley - Indiana University; Doug K. Tinkham - Laurentian University; Danie Grobler - Ivanplats




**MONDAY, JUNE 18**

**16:30 - 1219** **Injection of PGE-rich Ultramafic Magma Sheets into Crystalline Noritic-Anorthositic Sequences in the Critical Zone of the Bushveld Complex, South Africa**  
Roger Scoon - Rhodes University

**16:45 - 2287** **Platinum Group Element Mineralization Associated with Disseminated and Schlieren Type Chromite in the Ultramafic Series of the Stillwater Complex**  
Craig S. Bow - Group Ten Metals; Reid Keays - Monash University

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**MINERALS VI** **15:30 - 17:00** **ROOM 116**

**MIN25:** **Exploration Case Studies - Out of the Box Concepts, Methodologies and Practices II (AAG: 28th IAGS)**

**Organizers:** John Barr, AngloAmerican; Peter Bradshaw, FPX Nickel; Peter Winterburn, University of British Columbia

**Chairs:** Tim Baker, Eldorado Gold; John Barr; Peter Bradshaw; David Heberlein, Heberlein Geoconsulting; Barry Smee, Smee & Associates Consulting Ltd.; Ron Yehia, MYAR Consulting

**15:30 - 2284** **KEYNOTE: Out of the Box – Airborne Geochemical Surveys**  
John C. Barr - AngloAmerican; Peter Bradshaw - FPX Nickel Corp.

**16:00 - 1206** **The Adaptation of Geochemical Field Workflows from Pen And Paper into the 21st Century**  
Nathan Reid and Jens Klump - Commonwealth Scientific and Industrial Research Organisation (CSIRO); Brian Ballsun-Stanton - Macquarie University; Alistair White - CSIRO; Adela Sobotkova and Petra Janouchova - Macquarie University

**16:15 - 1205** **Real Time Hydrogeochemical Analysis, a New Tool for Exploration While or After Drilling**  
Nathan Reid and David Gray - Commonwealth Scientific and Industrial Research Organisation (CSIRO); Benjamin van der Hoek - University of South Australia; Yulia Uvarova - CSIRO

**16:30 - 1941** **Sweat, Sap And Emanations – What Trees and Snow Can Reveal About Hidden Mineralization**  
David Heberlein - Heberlein Geoconsulting; Colin Dunn - Colin Dunn Consulting Inc.

**16:45 - 2165** **Opening a Forty Year Old Box, Geochemical Research Yet to be Done**  
Barry Warren Smee - Smee and Associates Consulting Ltd.

**17:00 - 2231** **From Data to Knowledge - Augmented Reality to Augmented Earth Science**  
Matt Lato, Bill Burton, Ivy Li and Gerald Magnusson - BGC Engineering

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**MINERALS VII** **15:30 - 17:00** **ROOM 117**

**MIN41:** **Ensuring the Supply of Critical Materials to Meet the UN 2030 Sustainable Development Goals III**

**Organizers:** Damien Giurco, University of Technology Sydney; Lawrence Meinert, Colorado School of Mines; Gavin Mudd, RMIT University; Edmund Nickless, International Union of Geological Sciences (IUGS)

**Chair:** Lawrence Meinert

**15:30 - 1147** **Tantalum and Niobium - Geology, Resources, and the Supply Chain**  
George Jiri Simandl - BC Geological Survey

**15:45 - 2246** **A Moderated Debate: Peak Minerals - Does the World Need to Worry about Running out of Mineral Resources?**  
Saleem Hassan Ali - University of Delaware

*16:00 Panel Discussion*

MINERALS I		08:30 - 10:00	ROOM 109
MIN11:	<b>Multi-Commodity, Multi-Scale Exploration Targeting Using the Large Igneous Province Record I</b>		
Organizers:	Richard Ernst, Carleton University and Tomsk State University; Simon Jowitt, University of Nevada, Las Vegas		
Chairs:	Richard Ernst; Simon Jowitt; Chris Rogers, Carleton University; Rajesh Srivastava, Banaras Hindu University		
08:30 - 1472	<b>KEYNOTE: Multi-Commodity, Multi-Scale Exploration Targeting Using the Large Igneous Province Record</b> <i>Richard Ernst - Carleton University; Simon Jowitt - University of Nevada, Las Vegas</i>		
09:00 - 1188	<b>Golden LIPs: Links between Large Igneous Province Events and Gold Metallogeny</b> Simon Jowitt - University of Nevada, Las Vegas; Richard Ernst - Carleton University and Tomsk State University		
09:15 - 2361	<b>Role of Geochemical Studies in Characterizing Lips and the Opportunities of a New LIPs Geochemistry Database: An Example from the 1460-1470 Moyie Lip</b> Chris Rogers, Richard E. Ernst and Brian Cousens - Carleton University		
09:30 - 2041	<b>Petrochronology of Zircon in Ultramafic Rocks</b> James Scoates - University of British Columbia		
09:45 - 1523	<b>The Nature of the Mineralization and Tectonic Setting of the Katugin Rare-Metal Deposit (Southern Siberia)</b> Tatiana Donskaia, Dmitrii Gladkochub and Eugene Sklyarov - Siberian Branch of the Russian Academy of Sciences; Aleksander Kotov and Anatoliy Larin - Russian Academy of Sciences; Anastasiya Starikova and Anatoliy Mazukabzov - Siberian Branch of the Russian Academy of Sciences; Elena Tolmacheva and Sergei Velikoslavinsky - Russian Academy of Sciences		
MINERALS II		08:30 - 10:00	ROOM 110
MIN30:	<b>Mineral Exploration in Extreme Environments (AAG: 28th IAGS)</b>		
Organizers:	Stephen Cook, Teck Resources Ltd.; Brian Townley, University of Chile; Peter Winterburn, University of British Columbia		
Chairs:	Stephen Cook; Brian Townley		
08:30 - 1342	<b>Structural Mapping Through the Atacama Gravels Using Geomorphology: Implications for Exploration Under Cover</b> Alexandra E. Brown and Peter Winterburn - University of British Columbia		
08:45 - 1930	<b>Solute sources and sinks in Atacama aquifers: implications for hydrogeochemical mineral exploration</b> James Andrew Kidder, Matthew Leybourne and Daniel Layton-Matthews - Queen's University; Clinton Rissmann - Canterbury University		
09:00 - 2181	<b>Collecting the Extreme Surface Soil layer by helicopter: An Efficient, Effective and Rapid Geochemical Method for Arid and Semi-Arid Terrain</b> John C. Barr - AngloAmerican		
09:15 - 1209	<b>Duggan Lake regional drainage sediment and water geochemical survey, Barren Grounds, mainland Nunavut</b> Wayne Jackaman		


**TUESDAY, JUNE 19**

**09:30 - 1428 Mineral solubility modelling applied to interpreting stream and spring water chemistry in a mountainous region of British Columbia, Canada**  
Ray E. Lett - Geochemist

**09:45 - 1086 Snow geochemistry – a new environment friendly exploration method in the northern areas**  
Pertti Sarala - Geological Survey of Finland and Oulu Mining School;  
Anne Taivalkoski - Geological Survey of Finland

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**MINERALS IV** **08:30 - 10:00** **ROOM 114**


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**MIN55: Analytical Technology in the Search for Minerals: Space to the Lab to the Field I (AAG: 28th IAGS)**

**Organizers:** Gwendy E.M. Hall, Emeritus Scientist, Geological Survey of Canada; Bill MacFarlane, Exploration Consultants Associated; Jamil Sader, Bureau Veritas Commodities Canada Ltd.; Peter Winterburn, University of British Columbia (UBC)

**Chairs:** Alexandra Brown, UBC; Gwendy E.M. Hall; Jamil Sader; Ryan Shaw, UBC

**08:30 - 1691 KEYNOTE: 2008-2018 – The Portable XRF Decade**  
Aaron Baensch - Olympus

**09:00 - 2090 Portable instruments and field services: protocols to achieve fit-for-purpose quality data**  
Hugh A. de Souza, Alexander Seyfarth, Russ Calow and Peta Hughes - SGS Minerals

**09:15 - 1609 Low Level Field Analysis of Gold Using PXRF**  
Melvyn Lintern - Commonwealth Scientific and Industrial Research Organisation (CSIRO);  
Simon Bolster - Portable ppb Ltd.

**09:30 - 1702 Application of pXRF to environmental investigations and geochemical baseline of abandoned mines**  
Bruno Lemiere and Valerie Laperche - French Geological Survey

**09:45 - 1524 Hand held Laser Induced Breakdown Spectroscopy [LIBS]: A new tool for field geochemistry and mineralogy**  
Andrew Somers - SciAps Inc.

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**MINERALS V** **08:30 - 10:00** **ROOM 115**


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**MIN9: 20 Years of Porphyry Progress: A Cordilleran Perspective I**

**Organizers:** John Chapman, Geological Survey of Canada; James Lang, Hunter Dickinson Inc.; Libby Sharman, BHP

**Chairs:** John Dilles, Oregon State University; Jim Lang; Libby Sharman

**08:30 - 2376 Alkalic porphyry Cu-Au-Ag deposit(s) of Copper Mountain, southern British Columbia**  
Peter Holbek and Richard Joyes - Copper Mountain Mining Corp.

**08:45 - 2253 The Mount Polley Porphyry Copper deposit, South-Central British Columbia, Canada**  
Chris Rees - Imperial Metals Corp.

**09:00 - 2450 KEYNOTE: Tectonic controls and structural modification of porphyry and epithermal systems: examples from KSM, Red Mountain and Big Bulk, Northwest British Columbia**  
Lori Kennedy - University of British Columbia; Gayle Febbo - Exploration Petrology;  
Bram van Straaten and JoAnne Nelson - BC Geological Society

**09:30 - 2438 Gold Mineralisation at the Snowfield Porphyry Deposit**  
Emily Claire Laycock, Anthony Williams-Jones and Jim Clark - McGill University

**09:45 - 1461 The Red Chris Porphyry Copper-Gold deposit, Northwest British Columbia.**  
Chris Rees - Imperial Metals Corp.; Brock Riedell - Independent

MINERALS VI		08:30 - 10:00	ROOM 116
<b>MIN37:</b>	<b>Energy and Technology Metals: Rare Earth Elements, Lithium, and Related Advanced Materials - from Deposit Formation to Mining and Processing I</b>		
<b>Organizers:</b>	David Dreisinger, University of British Columbia; Kathryn Goodenough, British Geological Survey and University of Exeter; Heather Jamieson, Queen's University; Frances Wall, University of Exeter		
<b>Chairs:</b>	Paul Alexandre, Brandon University; Greg Andrews, Search Minerals Inc.; Anouk Borst, University of St Andrews; Kathryn Goodenough; Sarah Gordon, Satarla; Heather Jamieson; Volker Moeller, Avalon Advanced Materials Inc.; Paul Nex, University of Witwatersrand; Frances Wall		
<b>08:30 - 1240</b>	<b>KEYNOTE: Perspectives on critical elements for energy technologies</b> Rod Eggert - Colorado School of Mines		
<b>09:00 - 1212</b>	<b>A Detailed Assessment of Global Rare Earth Element Resources and Supply Challenges</b> Zhehan Weng - Independent Researcher; Simon Jowitt - University of Nevada, Las Vegas; Gavin Mudd - RMIT University; Nawshad Haque - Commonwealth Scientific and Industrial Research Organisation (CSIRO) Minerals Division		
<b>09:15 - 1530</b>	<b>A Tale of REE Ore Formation from Strange Lake, Canada</b> <i>Olga Vasyukova and Anthony E. Williams-Jones - McGill University</i>		
<b>09:30 - 1656</b>	<b>Nolans-type fluorapatite-REE deposits: carbonatite metasomatism and "anti-skarns"</b> <i>Michael Anenburg and John Mavrogenes - Australian National University</i>		
<b>09:45 - 2352</b>	<b>The Nechalacho REE-Nb-Zr Deposit, NWT, and Associated Rare Metal Pegmatites: Recent Research Advances</b> <i>Volker Moeller - Avalon Advanced Materials Inc.;</i> <i>Anthony E. Williams-Jones - McGill University</i>		
MINERALS VII		08:30 - 10:00	ROOM 117
<b>MIN35:</b>	<b>How Methodology Determines What Is Critical I</b>		
<b>Organizers:</b>	Ignacio Calleja, Roland Gauss and Karen Hanghøj, EIT RawMaterials		
<b>Chairs:</b>	Roland Gauss; Karen Hanghøj		
<b>08:30 - 2154</b>	<b>KEYNOTE: Criticality Methodology – How it Arose and Where It's Going</b> <i>Thomas Graedel - Yale University</i>		
<b>09:00 - 1361</b>	<b>Canada's role as a producer (and user) of critical raw materials</b> <i>Steven Young and Chris Yakymchuk - University of Waterloo</i>		
<b>09:15 - 1136</b>	<b>A Review of Elemental Trends in Comprehensive Studies of Criticality</b> <i>Sarah M. Hayes and Erin McCullough - U.S. Geological Survey</i>		
<b>09:30 - 2174</b>	<b>The EU perspective on Critical Raw Materials</b> <i>Milan Grohol - European Commission</i>		
<b>09:45 - 1238</b>	<b>Material Criticality and Manufacturing: Comparing China, the European Union, Japan and the United States</b> Rod Eggert - Colorado School of Mines		



TUESDAY, JUNE 19

MINERALS I		10:30 - 12:00	ROOM 109
MIN11:	<b>Multi-Commodity, Multi-Scale Exploration Targeting Using the Large Igneous Province Record II</b>		
Organizers:	Richard Ernst, Carleton University and Tomsk State University; Simon Jowitt, University of Nevada, Las Vegas		
Chairs:	Richard Ernst; Simon Jowitt; Chris Rogers, Carleton University; Rajesh Srivastava, Banaras Hindu University		
10:30 - 2031	<b>KEYNOTE: LIPs, Mineralization and Supercontinents: Constraints and Associations in Time and Space</b> Bruce Melville Eglington - University of Saskatchewan; Sally Pehrsson - Geological Survey of Canada; David Huston - Geoscience Australia; Richard Ernst - Carleton University		
11:00 - 1831	<b>LIPs of the West African craton and links with ore deposits and oil/gas: a preliminary assessment</b> <i>Nasrddine Youbi - Cadi Ayyad University; Richard Ernst - Carleton University and Tomsk State University; Lenka Baratoux - Université Toulouse and Institut Fondamental d'Afrique Noire; Mark Jessell - University of Western Australia; Ulf Soderlund - Lund University</i>		
11:15 - 1386	<b>Large igneous province (LIP) records of the Indian shield and prospects for a associated metallogeny</b> <i>Rajesh K. Srivastava - Banaras Hindu University; Richard Ernst - Carleton University; Amiya Samal - Banaras Hindu University</i>		
11:30 - 2079	<b>The hypothesis of a North China-São Francisco-Congo craton connection (1950-920 Ma): context for shared LIPs and potentially associated ore deposits</b> <i>Peng Peng - Chinese Academy of Sciences and University of Chinese Academy of Sciences; Wilson Teixeira - University of São Paulo; Huiru Xu - China University of Geosciences; Elson P. Oliveira - University of Campinas; Xixi Zhao - Tongji University; Lei Zhao - Chinese Academy of Sciences; Farid Chemale Junior - University of Campinas; Yanyan Zhou - Chinese Academy of Sciences; Richard Ernst - Carleton University and Tomsk State University</i>		
11:45 - 2360	<b>The 1418 Ma Highland-Purcell event of western Laurentia: distinguished from the 1460-1470 Ma Moyie LIP</b> <i>Chris Rogers, Richard E. Ernst and Brian Cousens - Carleton University; Ulf Söderlund - Lund University</i>		
MINERALS II		10:30 - 12:00	ROOM 110
MIN7:	<b>Magmatic Arc Fertility and the Genesis of Porphyry Cu-Mo-Au Deposits I</b>		
Organizers and Chairs:	Stephen Rowins, University of Western Australia; Matthew Steele-MacInnis, University of Alberta; Bram van Straaten, BC Geological Survey; Zoltan Zajacz, University of Toronto		
10:30 - 1158	<b>KEYNOTE: Why is my porphyry a dud?</b> <i>Jeremy P. Richards - Laurentian University</i>		
11:00 - 1653	<b>Distinctive Chemical Characteristics, Geodynamic Settings and Petrogenesis of Gold-Ore-Forming Arc Magmas</b> <i>Robert R. Loucks - University of Western Australia</i>		
11:15 - 1606	<b>Sulfur redox in subducting slabs and its effect on the Cu and Mo fertility in arc magmas</b> <i>Dante Canil; Rameses D'Souza - University of Victoria</i>		



11:30 - 1321 **Elevated magmatic sulfur and chlorine contents in syn-mineralization porphyry** of the Red Chris porphyry Cu-Au deposit, Northern British Columbia, Canada  
Jing-Jing Zhu and Jeremy Richards - Laurentian University; Chris Rees - Imperial Metals Corporation; Robert Creaser, Andrew DuFrane and Andrew Locock - University of Alberta; Joseph Petrus - Laurentian University; Jürgen Lang - University of Alberta

11:45 - 1210 **Sulfide saturation and arc metal budget connection: Evidence from the Chilas Complex, Kohistan arc, Pakistan**  
*Ijaz Ahmad and Jeremy P. Richards - Laurentian University; D. Graham Pearson - University of Alberta; Jingao Liu - China University of Geosciences; Muhammad T. Shah - University of Peshawar; Joseph A. Petrus - Laurentian University; Matthew Leybourne - Queen's University; Pedro Jugo - Laurentian University; Oliver Jagoutz - Massachusetts Institute of Technology*

**MINERALS III****10:30 - 12:00****ROOM 111**

**MIN1: Mineralization and Hydrocarbons in Black Shale Environments I**  
**Organizers:** Michael Gadd, Suzanne Paradis and Jan Peter, Geological Survey of Canada  
**Chair:** Jan Peter

10:30 - 1173 **KEYNOTE: Does the Cyclic Phanerozoic Ocean-Atmosphere System Control the Timing of Ores in Marine Black Shales?**  
*Ross Large - University of Tasmania*

11:00 - 1748 **KEYNOTE: Secular distribution of Highly Metalliferous Black Shales corresponds with Peaks in Past Atmosphere Oxygenation**  
*Sean Johnson - University College Dublin*

11:15 - 2345 **Finally mapping thallium: Evidence of a diagenetic origin for a classic sedimentary 'exhalative' Zn-Pb Deposit?**  
*Sam Spinks, Mark Pearce, Chris Ryan, Marcus Kunzmann and Louise Fisher - Commonwealth Scientific and Industrial Research Organisation (CSIRO) Mineral Resources*

11:30 - 1953 **Highly metalliferous black shales in Alberta**  
*Gloria Lopez, John Pawlowicz and Jill Weiss - Alberta Geological Survey*

11:45 - 2196 **Importance of anaerobic oxidation of methane for shale-hosted stratiform Zn-Pb mineralization: evidence from the Howards Pass district, Yukon/NWT**  
*Craig Johnson, John Slack, Julie Dumoulin and Karen Kelley - U.S. Geological Survey; Hendrik Falck - Northwest Territories Geological Survey*

**MINERALS IV****10:30 - 12:00****ROOM 114**

**MIN58: Geometallurgy I**  
**Organizers:** Andrew Bamber, Bara Consulting; John Barr, AngloAmerican; Sandra Birtel, Helmholtz-Zentrum Dresden-Rossendorf (HZDR); Thomas Chudy, University of British Columbia (UBC); Hugh de Souza, SGS Canada; Jens Gutzmer, HZDR; Julie Hunt, Bern Klein, David Turner and Peter Winterburn, UBC  
**Chairs:** Hugh de Souza; Laura Tusa, HZDR

10:30 - 1198 **KEYNOTE: Geological contributions to geometallurgy**  
*Julie Hunt - University of British Columbia; Ron Berry - University of Tasmania*

11:00 - 2150 **The Determination of Mineralogy of Lithium in a Pegmatite deposit for Geometallurgical Purposes, Separation Rapids Lithium Deposit, Northwestern Ontario**  
*William Mercer, Volker Moeller and J. Chris Pedersen - Avalon Advanced Materials Inc.*


**TUESDAY, JUNE 19**
**11:15 - 1979 Geochemistry of Hydrothermal Alteration Associations in Porphyry Copper Deposits: Applications to Geometallurgical Modeling**

Brian Keith Townley - University of Chile; Rodrigo Luca and Luis Lopez - GeoAV SA; Marcia Muñoz - Universidad Andres Bello; Pamela Castillo - University of Chile

**11:30 - 1203 Modelling mineralogy from whole rock assay data – a case study from Productora Cu-Au-Mo deposit, Chile**

Angela Escolme, Ron Berry and Julie Hunt - University of Tasmania; Scott Halley - Mineral Mapping Pty Ltd.; Warren Potma - CSA Global Pty Ltd.

**11:45 - 1193 Geochemical Input for Geomet Applications**

Pim van Geffen - Vancouver Geochemistry

**MINERALS V**
**10:30 - 12:00**
**ROOM 115**
**MIN9: 20 Years of Porphyry Progress: A Cordilleran Perspective II**

**Organizers:** John Chapman, Geological Survey of Canada; James Lang, Hunter Dickinson Inc.; Libby Sharman, BHP

**Chairs:** John Dilles, Oregon State University; James Lang; Libby Sharman

**10:30 - 2121 Recent advances in the geologic models for the Pebble Cu-Au-Mo deposit, SW Alaska**

Nansen Herman Olson and John Dilles - Oregon State University; James Lang - Hunter Dickinson Inc.

**10:45 - 2384 KEYNOTE: A survey of porphyry systems in the Yukon-Tanana upland, eastern Alaska, and their relationship to the magmatic and tectonic evolution of the region**

Douglas Cory Kreiner, James V. Jones III, Erin Todd, George Case and Christopher Holm-Denoma - U.S. Geological Survey

**11:15 - 2136 The RedGold Alkalic Porphyry Copper / Gold Project**

Rudi Durfeld; Bill Morton - Independent

**11:30 - 1897 Geology & Mineralization of the New Afton Porphyry Cu-Au Deposit, Kamloops B.C.**

Joanna Lipske; Devin Wade and Mark Petersen - New Gold, Inc.

**11:45 - 1635 IKE Copper-Molybdenum-Silver Porphyry Deposit: Fluid-rock Interactions associated with Vein Alteration Halos**

Megan Binner and Dan Marshall - Simon Fraser University; Michael Galicki and Mark Rebagliati - Amarc Resources Ltd.; Brock Riedell - Riedell Exploration Ltd.

**MINERALS VI**
**10:30 - 12:00**
**ROOM 116**
**MIN37: Energy and Technology Metals: Rare Earth Elements, Lithium, and Related Advanced Materials - from Deposit Formation to Mining and Processing II**

**Organizers:** David Dreisinger, University of British Columbia; Kathryn Goodenough, British Geological Survey and University of Exeter; Heather Jamieson, Queen's University; Frances Wall, University of Exeter

**Chairs:** Paul Alexandre, Brandon University; Greg Andrews, Search Minerals Inc.; Anouk Borst, University of St Andrews; Kathryn Goodenough; Sarah Gordon, Satarla; Heather Jamieson; Volker Moeller, Avalon Advanced Materials Inc.; Paul Nex, University of Witwatersrand; Frances Wall

**10:30 - 2440 Nd Isotopic Study of the Kipawa Rare Earth Element Deposit**

Marc Constantin - Université Laval; Ross Stevenson - Université du Québec à Montréal

**10:45 - 1164 Overview of the regolith-hosted REE deposits in South China: parent rock control and ore genesis**

Yan Hei Li and Mei-Fu Zhou - University of Hong Kong

11:00 - 1599 **A Genetic Model For The Giant Serra Verde Ion Adsorption REE Deposit, Brazil**  
 Richard Herrington, Carmen Pinto-Ward and Jamie Wilkinson - Natural History Museum;  
 Don Schissel - Denham Capital; Alexandre Rocha de Rocha - Consultant;  
 Andreas Sprecher - Arsago Capital

11:15 - 1383 **Unconventional ion-adsorption type REE deposits, what lies beneath: a case study from northwest Madagascar**  
 Eva Marquis - University of Brighton; Kathryn Goodenough - British Geological Survey;  
 Martin Smith - University of Brighton;  
 Guillaume Estrade - Géosciences Environnement Toulouse

11:30 - 2141 **Structural state of REE in ion adsorption deposits: A XANES/EXAFS study of laterites from Madagascar and China**  
 Anouk Margaretha Borst - University of St Andrews;  
 Martin Smith - University of Brighton; Adrian Finch - University of St Andrews;  
 Eva Marquis - University of Brighton; Guillaume Estrade - Paul Sabatier University Toulouse;  
 Jindrich Kynicky - Mendel University Brno; Cheng Xu - Peking University;  
 Kalotina Geraki - Diamond Light Source

MINERALS VII	10:30 - 12:00	ROOM 117
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MIN35:	<b>How Methodology Determines What Is Critical II</b>
Organizers:	Ignacio Calleja, Roland Gauss and Karen Hanghøj, EIT RawMaterials
Chairs:	Roland Gauss; Karen Hanghøj

10:30 - 1487	<b>Criticality of Rare Earth Elements: A China's Perspective</b> <i>Weiqiang Chen and Yan Ren - Chinese Academy of Sciences</i>
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10:45 - 1650	<b>Criticality Analysis of Rare Earth Elements based on Total Material Requirement</b> <i>Eiji Yamasue - Ritsumeikan University</i>
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11:00 - 2153	<b>Critical Metals for Lithium-Ion Batteries – Umicore strategies for sustainable sourcing of Cobalt</b> <i>Christian Hagelüken - Umicore &amp; ESM</i>
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11:15 - 2156	<b>Material criticality assessment in an industrial perspective</b> <i>Henrik Ørskov Pedersen - Grundfos</i>
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11:30 - 2478	<b>The mismatch between mining investments and the dynamics of critical raw materials</b> <i>Karen Hanghøj - EIT RawMaterials; Per Kalvig - Geological Survey of Denmark and Greenland</i>
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11:45	<b>Closing Remarks, Roland Gauss - EIT RawMaterials</b>
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MINERALS I	13:30 - 15:00	ROOM 109
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MIN20:	<b>Sediment-Hosted Base Metal Systems: Exploring the Nature, Formation and Role of Sedimentary Processes and Implications for Detection I</b>
Organizers:	Betsy Friedlander and Lara Loughrey, Teck Resources Ltd.
Chair:	Lara Loughrey

13:30 - 2503	<b>KEYNOTE: Integrated Mineral Systems and Empirical Targeting for Base Metals in Sedimentary Basins</b> <i>Neal Reynolds and Peter Muhling, CSA Global</i>
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**TUESDAY, JUNE 19**

- 14:00 - 2273**     **Silica diagenesis in mudstones; implications for Palaeozoic sediment-hosted massive sulphide deposits**  
 Sarah Gleeson - Helmholtz Centre GFZ Potsdam; Merilie Reynolds - University of Alberta;  
 Marcus Oelze and Joseph Magnall - Helmholtz Centre GFZ Potsdam
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- 14:15 - 2359**     **Sulphide mineralisation and barite replacement at the Macmillan Pass sediment hosted massive sulphide (SHMS) deposits (Selwyn Basin, Canada)**  
 Joseph Magnall and Sarah Gleeson - Helmholtz Centre GFZ Potsdam;  
 Suzanne Paradis - Geological Survey of Canada
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- 14:30 - 2250**     **The Iron Range Fault: Using Targeted Geoscience to Understand and Explore For Multiple Deposit Types in the Purcell Basin**  
 Chuck Downie - Eagle Plains Resources Ltd.
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- 14:45 - 2371**     **Metallogeny of the Vazante and Paracatu Zinc Silicate and Sulfide Districts, Brazil: Applications to Exploration of Base Metals in Proterozoic Basins**  
 Gema Ribeiro Olivo and Neil A. Fernandes - Queen's University; Gustavo Diniz Oliveira and Fernando Baia - Nexa Resources; Lena Monteiro - Universidade de Sao Paulo; Igor Carvalho - Universidade de Brasilia; Basilio Botura Neto - Nexa Resources; Paul Slezak and Alexandra McGladrey - Queen's University; Adalene Silva - Universidade de Brasilia; Daniel Layton-Matthews - Queen's University

**MINERALS II**
**13:30 - 15:00**
**ROOM 110**

- MIN7:**             **Magmatic Arc Fertility and the Genesis of Porphyry Cu-Mo-Au Deposits II**  
**Organizers**     Stephen Rowins, University of Western Australia; Matthew Steele-MacInnis, University of Alberta;  
**and Chairs:**     Bram van Straaten, BC Geological Survey; Zoltan Zajacz, University of Toronto

- 13:30 - 1151**     **KEYNOTE: Tectonics, magma fertility and the formation of porphyry deposits**  
 Pete Hollings - Lakehead University; David R. Cooke - University of Tasmania;  
 Michael D'Angelo - Lakehead University; Mingjian Cao - Chinese Academy of Sciences;  
 Gabe Sweet - Lakehead University; Emily Smyk and Michael Baker - University of  
 Tasmania; Huayong Chen - Chinese Academy of Sciences

- 14:00 - 1695**     **Giant porphyry Cu-Mo ore deposit formation in the Lesser Caucasus, Tethys belt: culminating event of a long-lived magmatic arc evolution**  
 Robert Moritz, Hervé Rezeau, Samvel Hovakimyan and Marion Grosjean - University of Geneva; Rodrik Tayan and Rafael Melkonyan - National Academy of Sciences; Alexey Ulyanov - University of Lausanne

- 14:15 - 2423**     **Porphyry formation during the onset of volcanism: Examples from the Golden Triangle, northwest BC**  
 Bram van Straaten and JoAnne Nelson - BC Geological Survey; Robert Creaser - University of Alberta; Richard Friedman - University of British Columbia

- 14:30 - 1099**     **Zircon and garnet chemistry of garnet-bearing porphyries from the middle Cauca porphyry Cu-Au belt, Colombia: igneous processes leading to fertility**  
 Thomas Bissig - Goldcorp Inc.; Hildebrando Leal Mejia - University of British Columbia

**MINERALS III**
**13:30 - 15:00**
**ROOM 111**

- MIN25:**           **Exploration Case Studies - Out of the Box Concepts, Methodologies and Practices III (AAG: 28th IAGS)**  
**Organizers:**     John Barr, AngloAmerican; Peter Bradshaw, FPX Nickel; Peter Winterburn, University of British Columbia  
**Chairs:**           Tim Baker, Eldorado Gold; John Barr; Peter Bradshaw; David Heberlien, Heberlien Geoconsulting; Barry Smee, Smee & Associates Consulting Ltd.; Ron Yehia, MYAR Consulting

- 13:30 - 1097 **A paradigm shift for sampling and analysis using rapid regional surface geochemistry**  
 Ryan Noble - Commonwealth Scientific and Industrial Research Organisation (CSIRO)  
 Mineral Resources; Nathan Reid and David Cole - CSIRO; Carmen Krapf - Geological  
 Survey of South Australia; Ignacio Gonzalez-Alvarez, Ian Lau, Jess Robertson and  
 Tenten Pinchand - CSIRO; Brian Ballsun-Stanton - Macquarie University
- 
- 13:45 - 1286 **A Key role of MSG survey in finding Taipinggou Mo deposit in east Inner Mongolia**  
 Mingqi Wang - China University of Geosciences; Yuyan Gao - China National Chemical  
 Engineering Group Corporation; Lulu Yuan and Fulong Lu - China University of Geosciences
- 
- 14:00 - 2226 **Discovery of Crater Facies Kimberlites in the East Dharwar Craton –  
 Analysis of the Transitional Sedimentation and Mantle Architecture**  
 Sojen Joy, Ferdi Winter, Robin Preston, Mike Roberts and Unnikrishnan Purushothaman -  
 De Beers Group Services

MINERALS IV	13:30 - 15:00	ROOM 114
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| MIN15:<br>Organizers<br>and Chairs: | <b>Iron Oxide Copper-Gold (<math>\pm</math> P, REE, U) and Related Deposits: The Debate Continues I</b><br>Pete Hollings, Lakehead University; Dave Lentz, University of New Brunswick;<br>Taofa Zhou, Hefei University of Technology   |
| 13:30 - 1978                        | <b>The IOCG-Porphyry Continuum: A Canadian Case Study</b><br>Mark Klapheke - Brandon University   |
| 13:45 - 2354                        | <b>KEYNOTE: Mineralization and mobilization of REEs in the Proterozoic Fe-Cu-(REE)<br/>           deposits in SW China and Northern Vietnam</b><br>Mei-Fu Zhou - University of Hong Kong; Wei Chen - Institute of Geochemistry;<br>Xiaochun Li - University of Hong Kong  |
| 14:15 - 1757                        | <b>A possible link between iron skarn and iron oxide-apatite mineralization in the Jinniu<br/>           volcanic basin, Daye district, eastern China</b><br>Hao Hu and Jianwei Li - China University of Geosciences, Wuhan;<br>Daniel Harlov - Helmholtz Centre GFZ Potsdam; David Lentz - University of New Brunswick                                 |
| 14:30 - 2344                        | <b>KEYNOTE: Porphyry deposits in the Middle-Lower Yangtze River Valley metallogenic belt:<br/>           a product of double reworking in an intracontinental setting</b><br>Taofa Zhou and Shiwei Wang - Hefei University of Technology;<br>Pete Hollings - Lakehead University; Noel White, Yu Fan and Dayu Zhang -<br>Hefei University of Technology |

MINERALS V	13:30 - 15:00	ROOM 115
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| MIN19:<br>Organizers:<br>Chair: | <b>Gold Deposits in Orogenic Belts I</b><br>Marc Bardoux, Barrick Gold Corporation; Hubert Mvondo, Maple Gold Mines; Luke Ootes,<br>BC Geological Survey; Edmond van Hees, Ministry of Northern Development and Mines<br>Marc Bardoux  |
| 13:30 - 2058                    | <b>KEYNOTE: A Review of Orogenic Gold Deposit Formation</b><br>Edmond van Hees - Ministry of Northern Development and Mines  |
| 14:00 - 1921                    | <b>Geochemistry of Fluid Inclusions in Native Gold</b><br>Edmond van Hees - Ministry of Northern Development and Mines; Joseph Graney -<br>Binghamton University; Greg Arehart - University of Nevada, Reno; Jeff Mauk - U.S.<br>Geological Survey; James O'Neil and Stephen Kesler - University of Michigan |
| 14:15 - 1469                    | <b>Trace element compositions of native gold from orogenic gold deposits</b><br>Haiming Liu and Georges Beaudoin - Université Laval; Olivier Côté-Mantha - Agnico<br>Eagle Mines Ltd.; Simon Jackson - Geological Survey of Canada   |


**TUESDAY, JUNE 19**

**14:30 - 1903**    **Geochemistry of the Dome Mine Ankerite Veins; Insights into Fluid Flow Pathways and the Multi-Stage Enrichment of a World-Class Orogenic Gold Deposit**  
 Jessica M. Stromberg - University of Winnipeg;  
 Neil Banerjee and Lisa Van Loon - University of Western Ontario

**14:45 - 1314**    **Evidence for gold enrichment associated with late-stage, oxidized fluids at the 144 Gap deposit, Western Timmins Camp**  
 Luke Howitt and Robert Linnen - University of Western Ontario

**MINERALS VI**
**13:30 - 15:00**
**ROOM 116**

**MIN37:**    **Energy and Technology Metals: Rare Earth Elements, Lithium, and Related Advanced Materials - from Deposit Formation to Mining and Processing III**

**Organizers:**    David Dreisinger, University of British Columbia; Kathryn Goodenough, British Geological Survey and University of Exeter; Heather Jamieson, Queen's University; Frances Wall, University of Exeter

**Chairs:**    Paul Alexandre, Brandon University; Greg Andrews, Search Minerals Inc.; Anouk Borst, University of St Andrews; Kathryn Goodenough; Sarah Gordon, Satarla; Heather Jamieson; Volker Moeller, Avalon Advanced Materials Inc.; Paul Nex, University of Witwatersrand; Frances Wall

**13:30 - 1746**    **Developing exploration models for critical metals in alkaline complexes and carbonatites**  
 Kathryn Goodenough - British Geological Survey; Frances Wall - University of Exeter

**13:45 - 1400**    **Petrographic and geochemical study of pyrochlore mineralization in the Saint-Honoré carbonatite, Saguenay, Quebec**  
 Donovan Desjardins and L. Paul Bédard - Université du Québec à Chicoutimi;  
 Guillaume Matton - Niobec Inc.

**14:00 - 1493**    **In situ carbonate geochemistry and petrography at the Saint-Honoré carbonatite: implications for niobium mineralization and magmatic evolution**  
 L. Paul Bédard, Pierre Bedeaux and Donovan Desjardins - Université du Québec à Chicoutimi;  
 Guillaume Matton - Niobec Inc.

**14:15 - 2017**    **Dolomite carbonatite formation through metasomatism, and consequences for Nb-Ta mineralogy in the Eldor Carbonatite Complex, Quebec**  
 Patrik Thorsten Schmidt and Iain Samson - University of Windsor;  
 Darren Smith - Dahrouge Geological Consulting Ltd.

**14:30 - 2301**    **Hydrothermal Concentration of Heavy REE from a Dolomite Carbonatite Source at Lofdal, Namibia**  
 Rowan Isabel Munro Wollenberg and Anthony Williams-Jones - McGill University

**14:45 - 1508**    **Understanding the behavior of critical metals in highly evolved magmatic and associated hydrothermal systems; the Blawn Formation, Wah Wah Mountains, Southwestern Utah**  
 Drew William Barkoff and Simon Jowitt - University of Nevada, Las Vegas

**MINERALS VII**
**13:30 - 15:00**
**ROOM 117**

**International Round Table on Materials Criticality (Part I)**

**Organizers:**    Roland Gauss, EIT RawMaterials; Alessandra Hool, ESM Foundation, Switzerland  
*This international Round Table will evaluate approaches to assessing materials criticality. The project shall advance the research in criticality assessment, foster international exchange and education in the topic, identify common ground and differences, and raise awareness towards materials criticality, especially in industry. It shall also lay the cornerstone for a long-lasting international network.*

MINERALS I		15:30 - 17:00	ROOM 109
MIN20:	<b>Sediment-Hosted Base Metal Systems: Exploring the Nature, Formation and Role of Sedimentary Processes and Implications for Detection II</b>		
Organizers:	Betsy Friedlander and Lara Loughrey, Teck Resources Ltd.		
Chair:	Lara Loughrey		
15:30 - 2064	<b>Diagenetic controls on the formation of the Anarraaq sediment-hosted Zn-Pb deposit, Red Dog district, Alaska, USA</b> <i>Merilie A. Reynolds - University of Alberta; Sarah Gleeson - Freie Universität Berlin; Elizabeth Friedlander and Jim McCusker - Teck Resources Limited; Robert Creaser and Richard Stern - University of Alberta</i>		
15:45 - 1893	<b>Discovery history, setting and mineralization styles at the Aktigiruiq Zn-Pb Exploration Target, Red Dog District, NW Alaska, USA</b> <i>James McCusker, Lara Loughrey, Edward Nelles and Hannah Mills - Teck Resources; Edward Crawford - Teck American</i>		
16:00 - 1481	<b>Incorporation of core log information in electrical resistivity tomography and IP survey: case of the Pb-Zn ore deposit of Lontzen-Poppelsberg (BE)</b> <i>Maxime Evrard - Liège University; Thomas Hermans - Gent University; Eric Pirard and Frédéric Nguyen - University of Liège</i>		
16:15	<i>Panel Discussion</i>		
MINERALS II		15:30 - 17:00	ROOM 110
MIN1:	<b>Mineralization and Hydrocarbons in Black Shale Environments II</b>		
Organizers:	Michael Gadd, Suzanne Paradis and Jan Peter, Geological Survey of Canada		
Chair:	Jan Peter		
15:30 - 1440	<b>Reconnaissance thallium isotope study of zinc-lead SEDEX mineralization and host rocks in the Howards Pass district, Selwyn Basin, Yukon</b> <i>Jan Peter and Michael Gadd - Geological Survey of Canada; Daniel Layton-Matthews and Alexandre Voinot - Queen's University</i>		
15:45 - 2142	<b>Phytoplankton growth inhibition in massive sulfide generating environments, Iberian Pyrite Belt</b> <i>Felipe González, Reinaldo Saez and Carmen Moreno - University of Huelva</i>		
MINERALS III		15:30 - 17:00	ROOM 111
MIN26:	<b>Towards Big Data: Applications of Data Analytics in Geochemistry II (AAG: 28th IAGS)</b>		
Organizers:	Eric Grunsky, Consultant; Pim van Geffen, Vancouver Geochemistry; Peter Winterburn, University of British Columbia		
Chairs:	Britt Bluemell, Bonanza Geosciences; Eric Grunsky; David Lawie, IMDEX, Australia; Samantha Scher, Corescan, Chile; Cliff Stanley, Acadia University; Pim van Geffen		
15:30 - 1909	<b>How Do I Log This? Hyperspectral Mineralogy and Geochemistry in the Epoch of Big Data</b> <i>Sam Scher, Ronell Carey and Brigette Martini - Corescan; Brenton Crawford, Tom Carmichael and Liam Webb - Solve Geosolutions</i>		
15:45 - 1268	<b>Closure in Geochemical Data: Is it always such a hazard?</b> <i>Clifford Read Stanley - Acadia University</i>		


**TUESDAY, JUNE 19**

- 16:00 - 1533**    **Artificial Intelligence Applications in Exploration and Metallurgy: The Roles of Human Knowledge and Terminology**  
 Clinton Smyth - Minerva Intelligence Inc.; David Poole - University of British Columbia;  
 Chris Ahern - Minerva Intelligence Inc.
- 
- 16:15 - 1287**    **Machine-assisted ore deposit mass balance evaluations in 3D**  
*Shawn Hood - University of Tasmania*
- 
- 16:30 - 1619**    **China Land Quality Geochemical Information System**  
*Liu Rongmei and Zhao Linlin - China Geological Survey*
- 
- 16:45 - 1125**    **Mineralisation-related element dispersion and anomaly context from regional and prospect scale multi-element soil data**  
*Alan William Mann - Consultant; Patrice de Caritat - Geoscience Australia;  
 Richard Lilly - University of Adelaide; Graham Sylvester - University of Western Australia*

**MINERALS IV**
**15:30 - 17:00**
**ROOM 114**

- MIN15:**        **Iron Oxide Copper-Gold ( $\pm$  P, REE, U) and Related Deposits: The Debate Continues II**  
**Organizers**    Pete Hollings, Lakehead University; Dave Lentz, University  
**and Chairs:**    of New Brunswick; Taofa Zhou, Hefei University of Technology
- 
- 15:30 - 1618**    **Formation of magmatic Fe-Ti-V-P deposits within the Lac St. Jean anorthosite suite, Saguenay, Quebec, Canada**  
*Mark Grant and Sarah Dare - University of Ottawa; Christian Tremblay - Consortium de recherche en exploration minérale (CONSOREM)*
- 
- 15:45 - 1928**    **Liquid-liquid immiscibility involving carbonate-rich fluids in an iron-oxide apatite setting**  
*Matthew Steele-MacInnis and Wyatt M. Bain - University of Alberta; Frank K. Mazdab - University of Arizona*
- 
- 16:00 - 1079**    **Geological controls on the genesis of the Candelaria-Punta del Cobre Iron Oxide Copper Gold district, Northern Chile**  
*Irene del Real and John Thompson - Cornell University; Jorge Carriedo - Lundin Mining*
- 
- 16:15 - 1542**    **The Chemistry and Textures of Magnetite from the Candelaria IOCG Deposit and Quince IOA Prospect in the Chilean Iron Belt**  
*María Alejandra Rodríguez Mustafa and Adam Simon - University of Michigan;  
 Irene del Real and John Thompson - Cornell University; Martin Reich and Fernando Barra - Universidad de Chile*
- 
- 16:30 - 2152**    **An overview of iron oxide-apatite deposits in the Bafq district, Central Iran**  
*Hassan Heidarian and David Lentz - University of New Brunswick;  
 Saeid Alirezai - Shahid Beheshti University*
- 
- 16:45 - 1176**    **Role of crustal contamination, melt immiscibility, and hydrothermal processes, in the formation of MtAp deposits, Atacama Desert, northern Chile**  
*Rebecca Nadine Babiak and John Hanchar - Memorial University of Newfoundland;  
 Fernando Tornos - Instituto de Geociencias*

**MINERALS V**
**15:30 - 17:00**
**ROOM 115**

- MIN50:**        **Mineral Prospectivity Modeling and Assessment of Undiscovered Mineral Resources II**  
**Organizers:**    John Carranza, University of KwaZulu-Natal; Jeff Harris, Geological Survey of Canada;  
                          Vesa Nykänen, Geological Survey of Sweden; Renguang Zuo, China University of Geosciences  
**Chairs:**        John Carranza; Vesa Nykänen; Mana Rahimi, University of British Columbia;  
                          Renguang Zuo



**15:30 - 1764** **Field validation of mineral prospectivity approaches, a first test of the CBA method**  
 Guillaume Bertrand - French Geological Survey and Institut des Sciences de la Terre d'Orléans; Thomas Gutierrez, Bruno Tourlière and Jérémie Melleton - French Geological Survey; Eric Gloaguen - French Geological Survey and Institut des Sciences de la Terre d'Orléans; Florent Cheval-Garabédian - University of Orléans and Institut des Sciences de la Terre d'Orléans

**15:45 - 1102** **Application of maximum entropy model for mineral prospectivity mapping**  
*Yue Liu - Chinese Academy of Sciences*

**16:00 - 2169** **Machine Learning and Big Data, The Future of Exploration Targeting**  
*Marc-Antoine Laporte and Thierry Plamondon Tremblay - SGS Geostat*

**16:15 - 1057** **Surficial Uranium Potential Mapping in Namaqualand region, South Africa**  
*Abdul Osman Kenan - Council for Geoscience*

**16:30 - 1095** **A hybrid gossan-based and knowledge-driven mineral prospectivity model of Zn-Pb-Cu±Au mineral system of the Nova Brasilândia Belt, SW Amazonian Craton**  
*Guilherme Ferreira da Silva, Gustavo Negrello Bergami, Elias Martins Guerra Prado, Dalton Rosemberg Valentim Silva, Wilson Lopes de Oliveira Neto and Leandro Duarte Campos - Geological Survey of Brazil*

**16:45 - 1377** **Fuzzy logic overlay as a tool for outlining and ranking permissive areas**  
*Vesa Nykänen, Tero Niiranen and Tuomo Törmänen - Geological Survey of Finland*

**MINERALS VI****15:30 - 17:00****ROOM 116**

**MIN37: Energy and Technology Metals: Rare Earth Elements, Lithium, and Related Advanced Materials - from Deposit Formation to Mining and Processing IV**

**Organizers:** David Dreisinger, University of British Columbia; Kathryn Goodenough, British Geological Survey and University of Exeter; Heather Jamieson, Queen's University; Frances Wall, University of Exeter

**Chairs:** Paul Alexandre, Brandon University; Greg Andrews, Search Minerals Inc.; Anouk Borst, University of St Andrews; Kathryn Goodenough; Sarah Gordon, Satarla; Heather Jamieson; Volker Moeller, Avalon Advanced Materials Inc.; Paul Nex, University of Witwatersrand; Frances Wall

**15:30 - 1399** **Scandium ore-genesis**  
*Anthony E. Williams-Jones and Olga Vasyukova - McGill University*

**15:45 - 1603** **Unconformity-related hydrothermal xenotime deposits: A new class of economically significant rare earth element (REE) mineralization**  
*Teimoor Nazari Dehkordi, Carl Spandler and Nicholas Oliver - James Cook University; Robin Wilson - Northern Minerals*

**16:00 - 1730** **Responsible sourcing of critical metals**  
*Frances Wall, Robert Pell and Ed Loye - University of Exeter*

**16:15 - 1694** **Life Cycle Assessment of rare earth production based on physical flowsheet models at Songwe Hill**  
*Robert Pell, Frances Wall and Xiaoyu Yan - University of Exeter*

**16:30 - 1771** **REE Recovery from Low-Grade IAD and Bauxites Using Heterotrophic Microbes**  
*Barbara Palumbo-Roe, Megan Barnett, Simon Gregory, Eimear Deady and Kathryn Goodenough - British Geological Survey*

**16:45 - 1902** **Integration of process mineralogy into the geometallurgy of critical element ore deposits**  
*Tassos Grammatikopoulos, Hugh De Souza and Chris Gunning - SGS Canada*

**MINERALS VII****15:30 - 17:00****ROOM 117**

**International Round Table on Materials Criticality (Part II)**

**Organizers:** Roland Gauss, EIT RawMaterials; Alessandra Hool, ESM Foundation, Switzerland



WEDNESDAY, JUNE 20

MINERALS I		08:30 - 10:00	ROOM 109
<b>MIN11:</b>	<b>Multi-Commodity, Multi-Scale Exploration Targeting Using the Large Igneous Province Record III</b>		
<b>Organizers:</b>	Richard Ernst, Carleton University and Tomsk State University; Simon Jowitt, University of Nevada, Las Vegas		
<b>Chairs:</b>	Richard Ernst; Simon Jowitt; Chris Rogers, Carleton University; Rajesh Srivastava, Banaras Hindu University		
<b>08:30 - 2047</b>	<b>Impact of Cretaceous Large Igneous Provinces on Hydrocarbon Exploration</b> <i>Steven Clark Bergman - Shell Exploration R&amp;D (retired); James Eldrett - Shell Global Solutions; Daniel Minisini - Shell International Exploration &amp; Production; Andrew Bishop - Ex-Shell International R&amp;D</i>		
<b>09:00 - 1251</b>	<b>Timing of thermal overmaturation and shale gas potential of the Ecca Group source rocks of southern Africa's Karoo Basin</b> <i>Michiel Olivier de Kock, Ossa Ossa Franz, Elijah Adeniyi, Georgy Belyanin, Nicolas Beukes and Jan Kramers - University of Johannesburg</i>		
<b>09:15 - 1419</b>	<b>Could genetic relationships exist between orthomagmatic and sedimentary base metal mineral systems?</b> <i>Timothy Ireland, Christopher Hunter and Jennifer Roskowski - First Quantum Minerals Ltd.; Scott Halley - Mineral Mapping Pty Ltd.</i>		
<b>09:30 - 2219</b>	<b>A temporal and causal link between ca. 1380 Ma large igneous provinces and black shales: Implications for geologic time scale and paleoenvironments</b> <i>Shuan-Hong Zhang - Chinese Academy of Geological Sciences; Richard Ernst - Carleton University; Jun-Ling Pei and Yue Zhao - Chinese Academy of Geological Sciences; Mei-Fu Zhou - University of Hong Kong; Guo-Hui Hu - Chinese Academy of Geological Sciences</i>		
<b>09:45 - 1521</b>	<b>Main stages of ore-formation processes within the Kalar-Udokan ore region (Aldan shield, Siberian craton) and links with Large Igneous Provinces</b> <i>Dmitrii Gladkochub, Tatiana Donskaia and Eugene Sklyarov - Siberian Branch of the Russian Academy of Sciences; Aleksander Kotov - Russian Academy of Sciences; Richard E. Ernst - Carleton University and Tomsk State University; Viktor Kovach - Russian Academy of Sciences</i>		
<b>10:00 - 1799</b>	<b>Can mantle plumes associated with LIPs destroy diamonds?</b> Richard Ernst - Carleton University; Rhodri Davies - The Australian National University; Simon Jowitt - University of Nevada, Las Vegas; Ian Campbell - The Australian National University		
MINERALS II		08:30 - 10:00	ROOM 110
<b>MIN51:</b>	<b>Ore Fertility Indicators: Fingerprinting Magmatic Processes to Evaluate Resource Formation I</b>		
<b>Organizers:</b>	Farhad Bouzari, Craig Hart, Robert Lee and Alan Wainwright, University of British Columbia		
<b>Chairs:</b>	Farhad Bouzari; Robert Lee; Alan Wainwright		
<b>08:30 - 2305</b>	<b>KEYNOTE: Zircon Geochemistry as an Indicator of Porphyry Copper Magma Fertility</b> <i>John Dilles - Oregon State University</i>		
<b>09:00 - 1868</b>	<b>The application of U-Pb dating and TREE analyses by LA-ICP-MS of zircons in the Brownfield Exploration environment for porphyry copper deposits</b> <i>Christopher Reed, Scott Blevings, Marcelo Vega, Paula Alvarado and Andres Castillo - Teck Resources Ltd.</i>		

**WEDNESDAY, JUNE 20**

09:15 - 1587 **District-scale Porphyry Fertility Assessment of Intrusive Rocks Using Zircon Trace Element Geochemistry: Insights from the Cowal District, Australia**  
 Christopher Leslie, Sebastien Meffre and David Cooke - University of Tasmania;  
 Ned Howard - Evolution Mining Ltd.

09:30 - 2190 **Magmatism and mineralization of the tungsten deposits of the Northern Jiangnan Proterozoic terrane, China**  
*Dayu Zhang and Taofa Zhou - Hefei University of Technology*

09:45 - 1458 **Constraints on magma evolution from trace-element chemistry of Fe-Ti oxide intergrowths in the Eastern Gabbro, Coldwell Complex, Canada**  
*Matthew Brzozowski, Iain Samson and Joel Gagnon - University of Windsor;*  
*David Good and Robert Linnen - Western University*

MINERALS III	08:30 - 10:00	ROOM 111
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**MIN2: Exploring Controls on Ore Deposit Formation in Volcanic and Sedimentary Environments and Evaluating the VMS-SEDEX-MVT Continuum I**  
**Organizers and Chairs:** Sean McClenaghan, Trinity College Dublin; Suzanne Paradis, Geological Survey of Canada; Stephen Piercey, Memorial University of Newfoundland

08:30 - 1436 **Bathurst Mining Camp, New Brunswick Canada, an update**  
*James A. Walker - New Brunswick Geological Survey; Robin Adair - Osisko Metals;*  
*Tim Kingsley - Trevali Mining New Brunswick*

08:45 - 2392 **Resolving terrigenous and hydrothermal inputs in volcanogenic massive sulphide horizons of the Bathurst Mining Camp**  
*Sean Harrison McClenaghan - Trinity College Dublin; David Lentz - University of New Brunswick*

09:00 - 2481 **The Geology and Genesis of the Greens Creek Deposit**  
*Nathan Steeves and Bruce Gemmill - University of Tasmania*

09:15 - 1972 **Volcanism and SEDEX formation in the Selwyn Basin, central Yukon, Canada: Is there a genetic link?**  
*Nancy Van Wagoner - Thompson Rivers University; Suzanne Paradis - Geological Survey of Canada; Matthew Leybourne - Queen's University*

09:30 - 1830 **Paleoproterozoic volcanogenic massive sulfide mineralization, Karrat Group, Central Kangiussap Kuua, West Greenland**  
*Michelle DeWolfe - Mount Royal University; Jochen Kolb - Karlsruhe Institute of Technology; Erik Vest Sørensen - Geological Survey of Denmark and Greenland*

09:45 - 2055 **Mineral chemistry of gahnite from the Lalor metamorphosed VMS deposit, Snow Lake, MB, Canada**  
*Elliot Andrew Wehrle, Doug Tinkham and Andrew McDonald - Laurentian University*

MINERALS IV	08:30 - 10:00	ROOM 114
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**MIN55: Analytical Technology in the Search for Minerals: Space to the Lab to the Field II (AAG: 28th IAGS)**  
**Organizers:** Gwendy E.M. Hall, Emeritus Scientist, Geological Survey of Canada; Bill MacFarlane, Exploration Consultants Associated; Jamil Sader, Bureau Veritas Commodities Canada Ltd.; Peter Winterburn, University of British Columbia (UBC)  
**Chairs:** Alexandra Brown, UBC; Gwendy E.M. Hall; Jamil Sader; Ryan Shaw, UBC

08:30 - 2469 **Soil Clay Fraction Geochemistry for Surficial Exploration: a case study from the Tethyan Belt**  
*Jamil Sader - Bureau Veritas Minerals; Chris Benn - Consultant; Nikolay Zhivkov and Tsvetana Jeleva - Dundee Precious Metals; Roger Anderson - Bureau Veritas Minerals*


**WEDNESDAY, JUNE 20**

- 08:45 - 1347 Mineralogical reaction modelling of partial extractions in geochemical samples**  
 Ryan Shaw and Peter Winterburn - University of British Columbia
- 09:00 - 2083 Exploring for laterally transported copper through gravels cover using radon detectors**  
 Thomas Bissig - Goldcorp Inc.; Peter Winterburn - University of British Columbia
- 09:15 - 2101 ARTPhot: Automated routine for grain counting using a digital microscope and a neural network**  
 Alexandre Néron and Réjean Girard - IOS Services Geoscientifiques Inc.; Paul Bédard - Université du Québec à Chicoutimi

**MINERALS V 08:30 - 10:00 ROOM 115**

- MIN50: Mineral Prospectivity Modeling and Assessment of Undiscovered Mineral Resources III**
- Organizers:** John Carranza, University of KwaZulu-Natal; Jeff Harris, Geological Survey of Canada; Vesa Nykänen, Geological Survey of Sweden; Renguang Zuo, China University of Geosciences
- Chairs:** John Carranza; Vesa Nykänen; Mana Rahimi, University of British Columbia; Renguang Zuo

- 08:30 - 1053 Mineral system integration analysis based on big data for 3D polymetallic targeting in Luanchuan district (China)**  
 Gongwen Wang - China University of Geosciences, Beijing

- 08:45 - 2222 A 3D subsurface model of the geology and Sn-W deposits of the Erzgebirge (Germany/Czech Republic) and its utilization for 3D mineral potential mapping**  
 Andreas Brosig, Andreas Knobloch, Claus Legler, Peggy Hielscher, Sven Etzold, Enrico Kallmeier, Peter Bock and Andreas Barth - Beak Consultants GmbH

- 09:00 - 1245 3D geological modeling for prediction of subsurface Cu (Au) targets in the Tongling district, China**  
 Gaoshen Tao, Gongwen Wang and Zhiqiang Zhang - China University of Geosciences

- 09:15 - 2221 How to identify new resource potentials for classical and critical metals in a traditional mining district: Example Erzgebirge (Germany)**  
 Enrico Kallmeier, Andreas Knobloch, Andreas Brosig, Andreas Barth and Claus Legler - Beak Consultants GmbH

- 09:30 - 1340 The risks in fundamentals of recoverable resource models**  
 Mario E Rossi - GeoSystems International; Julio Bruna and Jose Bassan - Patagonia Geosciences

**MINERALS VI 08:30 - 10:00 ROOM 116**

- MIN37: Energy and Technology Metals: Rare Earth Elements, Lithium, and Related Advanced Materials - from Deposit Formation to Mining and Processing V**
- Organizers:** David Dreisinger, University of British Columbia; Kathryn Goodenough, British Geological Survey and University of Exeter; Heather Jamieson, Queen's University; Frances Wall, University of Exeter
- Chairs:** Paul Alexandre, Brandon University; Greg Andrews, Search Minerals Inc.; Anouk Borst, University of St Andrews; Kathryn Goodenough; Sarah Gordon, Satarla; Heather Jamieson; Volker Moeller, Avalon Advanced Materials Inc.; Paul Nex, University of Witwatersrand; Frances Wall

- 08:30 - 1980 REE mobilization by low-temperature hydrocarbon-bearing brines**  
 Pilar Lecumberri-Sanchez - University of Alberta; Mohammed Bouabdellah and Oussama Zemri - Mohammed Premier University, Morocco

**WEDNESDAY, JUNE 20**

08:45 - 2272	<b>Do Geothermal Systems Play a Role in Lithium Brine Enrichment in Nevada Playas?</b> Catherine Jean Hickson and Mark Coolbaugh - Dajin Resources Corp.
09:00 - 2223	<b>The inter-relationship between lithium brines and clays in the playa lake environment</b> <i>C. Tucker Barrie</i>
09:15 - 1172	<b>The Taron Cesium Deposit, Salta Province, Argentina</b> <i>Bruce Downing; David Trueman - Consultant</i>
09:30 - 2209	<b>Lithium extraction from produced water</b> <i>Pamela Daitch - University of Texas at Austin</i>
09:45 - 1960	<b>Interpretation and application of hydrogeological concepts to commercial-scale brine extraction projects</b> <i>Pablo Cortegoso - SRK Consulting</i>

<b>MINERALS VII</b>	<b>08:30 - 10:00</b>	<b>ROOM 117</b>
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<b>MIN17: Organizers and Chairs:</b>	<b>Reassessing Gold Deposit Models for the 21st Century I</b> Murray Allan, University of British Columbia; Daniel Kontak, Laurentian University
08:30 - 2242	<b>Geological setting of the Detour Lake gold mine and Lower Detour zones, northern Abitibi Subprovince, Ontario: Analogies and exploration implications</b> <i>Sébastien Castonguay, Benoît Dubé, Patrick Mercier-Langevin and Vicki McNicoll - Geological Survey of Canada; Adree Delazzer - Detour Gold Corporation</i>
08:45 - 1982	<b>Implications of the 2740 Ma Cote Gold Au(-Cu) deposit for Archean gold metallogeny and porphyry Au deposit formation in the Archean Swayze greenstone belt, northern Ontario</b> <i>Daniel Kontak - Laurentian University; Laura Katz and Jocelyn Smith - Iamgold Corporation; Blandine Gourcerol - French Geological Survey; Bruno Lafrance - Laurentian University; Benoît Dube - Geological Survey of Canada; Joe Petrus - Laurentian University; Robert Creaser - University of Alberta; Mostafa Fayek - University of Manitoba</i>
09:00 - 1967	<b>Phanerozoic Orogenic Gold Deposits: Concepts and Models</b> <i>James Mortensen - University of British Columbia; Dave Crow and Doug MacKenzie - University of Otago; Murray Allan - University of British Columbia; Robert Chapman - University of Leeds</i>
09:15 - 1660	<b>Trace and stable isotopic evidence for the origin of vuggy silica in high sulfidation gold deposits</b> <i>John Mavrogenes and Bozana Pasic - Australian National University</i>
09:30 - 2043	<b>Looking for Gold in all the Wrong Places – ATAC Resources Ltd. Rackla Gold Project</b> <i>Rob Carne - ATAC Resources Ltd.; Bill Wengzynowski - Consultant; Julia Lane - Archer, Cathro &amp; Associates (1981) Limited</i>
09:45 - 1943	<b>Structural controls on gold in progressively deformed host rocks: examples from Phanerozoic orogenic gold districts of the Canadian Cordillera</b> <i>Murray Allan - University of British Columbia; David Rhys - Panterra Geoservices; James Mortensen and Craig Hart - University of British Columbia</i>

<b>MINERALS I</b>	<b>10:30 - 12:00</b>	<b>ROOM 109</b>
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<b>MIN11:</b>	<b>Multi-Commodity, Multi-Scale Exploration Targeting Using the Large Igneous Province Record IV</b>
<b>Organizers:</b>	Richard Ernst, Carleton University and Tomsk State University; Simon Jowitt, University of Nevada, Las Vegas
<b>Chairs:</b>	Richard Ernst; Simon Jowitt; Chris Rogers, Carleton University; Rajesh Srivastava, Banaras Hindu University


**WEDNESDAY, JUNE 20**

- 10:30 - 1842** **KEYNOTE: Formation of chonolith-hosted magmatic sulfide deposits from dikes and sills**  
James Mungall - Carleton University; Stephen Barnes - Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- 
- 11:00 - 1535** **Siberian Traps: analyze of magmatism evolution as a way to discovery of new PGE-Cu-Ni deposits**  
*Nadezhda Krivolutskaya - Russian Academy of Sciences; Anton Latyshev - Moscow State University; Bronislav Gongalskiy and Natalia Svirskaya - Russian Academy of Sciences; Yana Bychkova - Moscow State University; Elena Makarieva and Aleksander Makariev - Polar Marine Expedition; Tamara Vekshina - Russian Academy of Sciences*
- 
- 11:15 - 1878** **Paleomagnetic correlation of volcanic formations and ore-bearing intrusions of the Norilsk region (Northern Siberia)**  
*Vladimir Pavlov, Russian Academy of Sciences; Anton Latyshev, Roman Veselovskiy and Anna Fetiosova - Russian Academy of Sciences and Lomonosov Moscow State University*
- 
- 11:30 - 1866** **Early mafic magmas of the Coldwell Complex, and evidence for a widespread contribution of magma from the SCLM in the Midcontinent Rift, Canada**  
*David J. Good - Western University; Peter Lightfoot - Lightfoot Geoscience*
- 
- 11:45 - 2033** **New Perspectives on the Timescales of Emplacement and Crystallization of Ultramafic Rocks from Integrated CA-ID-TIMS and LA-ICP-MS U-Pb Geochronology**  
*Nichole Moerhuis, Thomas J. Ver Hoeve and James S. Scoates - University of British Columbia; Graham T. Nixon - BC Geological Survey; Richard M. Friedman and Matthew J. Manor - University of British Columbia*

**MINERALS II**
**10:30 - 12:00**
**ROOM 110**

- MIN51: Ore Fertility Indicators: Fingerprinting Magmatic Processes to Evaluate Resource Formation II**  
**Organizers:** Farhad Bouzari, Craig Hart, Robert Lee and Alan Wainwright, University of British Columbia  
**Chairs:** Farhad Bouzari; Robert Lee; Alan Wainwright
- 
- 10:30 - 1479** **Volcanic-plutonic connections and metal fertility of highly evolved magma systems: a case study from the Herberton Sn-W-Mo Mineral Field, Queensland, Australia**  
*Carl Spandler, Yanbo Cheng, Zhaoshan Chang and Gavin Clarke - James Cook University*
- 
- 10:45 - 2235** **Laser Ablation ICP-MS on Biotite and K-feldspar in Sn-W-Mo-Bearing Mount Douglas Leucogranites, NB: Implications of Metallogenic Evolution**  
*Nadia Mohammadi, Dave Lentz and Chris McFarlane - University of New Brunswick*
- 
- 11:00 - 1285** **Discriminating between different types of hydrothermal epidote from the Yerington district, Nevada using X-ray fluorescence microscopy and LA-ICPMS**  
*Ayesha Ahmed and David Cooke - University of Tasmania; Louise Fisher and Mark Pearce - Commonwealth Scientific and Industrial Research Organisation (CSIRO); Angela Escolme and Ivan Belousov - University of Tasmania*
- 
- 11:15 - 2128** **Apatite Chemical Composition from Acadian-Related Granitoids of New Brunswick, Canada: implication for petrogenesis and metallogenesis**  
*Zeinab Azadbakht, Dave Lentz and Christopher McFarlane - University of New Brunswick*
- 
- 11:30 - 1681** **Apatite and Titanite Characteristics of Porphyry Fertile Plutons**  
*Farhad Bouzari and Craig Hart - University of British Columbia; Thomas Bissig - Goldcorp Inc.; Guillaume Lesage - University of British Columbia*
- 
- 11:45 - 2307** **The application of indicator minerals to the exploration for porphyry and epithermal deposits**  
*Robert Lee, Farhad Bouzari, Alan Wainwright and Craig Hart - University of British Columbia*

MINERALS III		10:30 - 12:00,	ROOM 111
<b>MIN2:</b>	<b>Exploring Controls on Ore Deposit Formation in Volcanic and Sedimentary Environments and Evaluating the VMS-SEDEX-MVT Continuum II</b>		
<b>Organizers and Chairs:</b>	Sean McClenaghan, Trinity College Dublin; Suzanne Paradis, Geological Survey of Canada; Stephen Piercey, Memorial University of Newfoundland		
<b>10:30 - 2200</b>	<b>MVT-type mineralization in western Newfoundland: Geochemical characteristics and importance of late-stage orogenic fluid flow</b> <i>James Conliffe - Geological Survey of Newfoundland and Labrador; Robert King and Derek Wilton - Memorial University of Newfoundland</i>		
<b>10:45 - 1149</b>	<b>Mount Brussiloff fersmite - a time constraint on magnesite, MVT mineralization, dolomitization, and a Nb-REE hydrothermal event in SE British Columbia</b> George Jiri Simandl - BC Geological Survey; Joseph Petrus - Laurentian University; Matthew Leybourne - Queen's Facility for Isotope Research; Suzanne Paradis - Geological Survey of Canada; Douglas Archibald - Queen's University; Carlee Akam - BC Geological Survey		
<b>11:00 - 1845</b>	<b>LA-ICP-MS element mapping: a window to visualise the distribution of critical metal content in pyrite</b> Lingli Zhou - Trinity College Dublin; Christophe Bonnetti - East China University of Technology ;Guotao Sun - Chinese Academy of Sciences; Balz Kamber and Thomas Riegler - Trinity College Dublin		
MINERALS IV		10:30 - 12:00	ROOM 114
<b>MIN58:</b>	<b>Geometallurgy II</b>		
<b>Organizers:</b>	Andrew Bamber, Bara Consulting; John Barr, AngloAmerican; Sandra Birtel, Helmholtz-Zentrum Dresden-Rossendorf (HZDR); Thomas Chudy, University of British Columbia (UBC); Hugh de Souza, SGS Canada; Jens Gutzmer, HZDR; Julie Hunt, Bern Klein, David Turner and Peter Winterburn, UBC		
<b>Chairs:</b>	Hugh de Souza; Laura Tusa, HZDR		
<b>10:30 - 1714</b>	<b>Integration of VNIR-SWIR hyperspectral core scanning in predictive geometallurgical modelling</b> <i>Laura Tusa and Louis Andreani - HZDR;</i> <i>Sabine Gilbricht - Technische Universität Bergakademie Freiberg;</i> <i>Paul Ivascanu - Eldorado Gold Corporation; Richard Gloaguen and Jens Gutzmer - HZDR</i>		
<b>10:45 - 1853</b>	<b>Mineral and Textural Classification from Hyperspectral Data for Geometallurgical Approach</b> <i>Javier Merrill - Commonwealth Scientific and Industrial Research Organisation (CSIRO) and University of Chile; Eduardo Diaz, Leandro Voisin and Brian Townley - University of Chile</i>		
<b>11:00 - 2463</b>	<b>Linking ore 'hardness' to XRF and hyperspectral imaging sensor response: a proof of concept study</b> <i>Thomas Chudy - University of British Columbia; David Turner - MineSense Technologies; Stefan Nadolski - University of British Columbia; Andrew Bamber - Bara Consulting; Bern Klein and Lee Groat - University of British Columbia</i>		
<b>11:15 - 1854</b>	<b>Geometallurgical approach for the integration of solar energy into mineral processing</b> <i>Willy Kracht and Giovanni Pamparana - Universidad de Chile; Julian Ortiz - Queens University</i>		
<b>11:30 - 1797</b>	<b>Application of Grade Control Model updating by Compositional Sequential Ensemble Filtering</b> <i>Angel Prior - Helmholtz Institute Freiberg</i>		


**WEDNESDAY, JUNE 20**

**11:45 - 1987** **Geometallurgical modeling methodology based on Data Science**  
Daniel Oscar Baeza, Felipe Navarro, Mauricio Garrido, Alvaro Egana and Brian Townley - University of Chile

**MINERALS V** **10:30 - 12:00** **ROOM 115**

**MIN64:** **Mine Wastes and the Environment: Contamination, Management and Reclamation I**  
**Organizers:** Heather Jamieson, Queen's University; Matthew Lindsay, University of Saskatchewan; Lesley A. Warren, University of Toronto

**Chairs:** Heather Jamieson; Gerdhard Jessen, University of Toronto; Matthew Lindsay; Clare Miller, Queen's University; Sarah Rudderham, University of Saskatchewan; Chris Schuh, Queen's University; Lesley Warren

**10:30 - 1706** **KEYNOTE: New strategies to tackle an old problem: combining geochemistry and microbiology to accelerate tailings remediation**  
*Talitha Santini - University of Queensland*

**11:00 - 2332** **The impact of ancient mining activity on the critical zone: the example of the Peisey-Nancoix Pb-Ag mine (19th-20th Century)**  
*Magali Rossi, Emmanuel Naffrechoux and Emilie Lyautey - Université Savoie Mont-Blanc; Stéphane Pesce - National Research Institute of Science and Technology for Environment and Agriculture; Laura Amigo, David Gateuille, Ayanleh Mahamoud Ahmed, Estelle Camizuli and Dominique Gasquet - Université Savoie Mont-Blanc*

**11:15 - 1438** **The influence of sediment focusing on arsenic geochemistry in lake sediments impacted by ore roasting at legacy gold mines near Yellowknife, NT**  
*Chris Schuh and Heather E. Jamieson - Queen's University; Michael J. Palmer - Carleton University; Alan J. Martin - Lorax Environmental Services; Jules M. Blais - University of Ottawa*

**11:30 - 1534** **Arsenic Mobility in a Changing Northern Climate: Implications for Geochemical Baselines and Contaminant Stability in Lake Systems, Tundra Mine, NWT**  
*Clare Miller - Queen's University; Michael Parsons - Geological Survey of Canada (GSC); Heather Jamieson - Queen's University; Jennifer Galloway - GSC; Timothy Patterson - Carleton University*

**11:45 - 2282** **Rare Earth Elements and Yttrium (REY) biogeochemical cycling in mining impacted environments**  
*Danielle Fortin - University of Ottawa; Elizabeth J. Ashby - Golder Associates*

**MINERALS VI** **10:30 - 12:00** **ROOM 116**

**MIN37:** **Energy and Technology Metals: Rare Earth Elements, Lithium, and Related Advanced Materials - from Deposit Formation to Mining and Processing VI**

**Organizers:** David Dreisinger, University of British Columbia; Kathryn Goodenough, British Geological Survey and University of Exeter; Heather Jamieson, Queen's University; Frances Wall, University of Exeter

**Chairs:** Paul Alexandre, Brandon University; Greg Andrews, Search Minerals Inc.; Anouk Borst, University of St Andrews; Kathryn Goodenough; Sarah Gordon, Satarla; Heather Jamieson; Volker Moeller, Avalon Advanced Materials Inc.; Paul Nex, University of Witwatersrand; Frances Wall

**10:30 - 1997** **Lithium: From Exploration to End-user**  
*Sarah Gordon - Satarla*

**10:45 - 2077** **Controls on Lithium-Rubidium-Mineralisation in the Separation Rapids Deposit, Ontario**  
*Volker Moeller, William Mercer and Jens C. Pedersen - Avalon Advanced Materials Inc.*



11:00 - 2427	<b>Li Micas in the Separation Rapids Pegmatite Field, Ontario: Compositional Controls on a Second Lithium Ore Mineral</b> Clifford Read Stanley - Acadia University; Bill Mercer, Chris Pederson and Volker Moeller - Avalon Advanced Materials Inc.
11:15 - 2439	<b>An integrated stable isotopic and textural study of the Little Nahanni LCT-type rare-metal pegmatite system, NWT</b> <i>Jeremie Pfister - Laurentian University</i>
11:30 - 2337	<b>Metamorphic origin of spodumene pegmatites in the Eastern Alps (Central Europe)</b> <i>Tanja Knoll - Geological Survey of Austria; Heinrich Mali - Montanuniversität Leoben; Holger Paulick, Ralf Schuster and Benjamin Huet - Geological Survey of Austria; Monika Horschinegg - University of Vienna</i>
11:45 - 1788	<b>Rare-element distribution in white mica and columbite–tantallite in an LCT pegmatite from SE Ireland</b> <i>David Kaeter and Julian Menuge - University College Dublin; David Chew - University College Dublin and Trinity College Dublin</i>

<b>MINERALS VII</b>	<b>10:30 - 12:00</b>	<b>ROOM 117</b>
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<b>MIN17: Organizers and Chairs:</b>	<b>Reassessing Gold Deposit Models for the 21st Century II</b> Murray Allan, University of British Columbia; Daniel Kontak, Laurentian University
10:30 - 1499	<b>Sedimentary Pyrite in Carbonaceous Shales; the ideal source for Au, As, S and Te in orogenic gold deposits</b> <i>Ross Large and Jeff Steadman - University of Tasmania; Dan Gregory - University of California, Riverside; Patrick Sack - Yukon Geological Survey; Sebastien Meffre - University of Tasmania</i>
10:45 - 1319	<b>Pervasive fluid flow: a key process in formation of bulk-mineable orogenic gold deposits</b> <i>David Crow and Doug MacKenzie - University of Otago; Jim Mortensen - University of British Columbia</i>
11:00 - 2075	<b>Protracted and complex fluid histories the norm in orogenic-type gold deposits as revealed by LA ICP-MS sulfide mapping</b> <i>Daniel Kontak - Laurentian University; Jacob Hanley - Saint Mary's University; Blandine Gourcerol - French Geological Survey; Joe Petrus, Kelly Malcolm, Mitch Kerr, Chris Kelly, Marie Letourneau and Jordan McDivitt - Laurentian University; Kevin Neyedley - Saint Mary's University; Scott Tokaryk - Laurentian University</i>
11:15 - 1585	<b>Gold Deposits of the Cowl District, Central New South Wales; Alkalic-type Epithermal Gold Mineralization</b> <i>Christopher Leslie, David Cooke and Sebastien Meffre - University of Tasmania; Ned Howard - Evolution Mining Ltd.</i>
11:30 - 1442	<b>Differentiating sources of hydrothermal fluids responsible for gold-bearing deposits</b> <i>Ryan D. Taylor, Heather Lowers and Erin Marsh - U.S. Geological Survey</i>
11:45 - 1108	<b>Fluid diversity in the Archean orogenic gold deposits of the Abitibi Greenstone Belt, Canada: Working towards a better constrained orogenic gold model</b> <i>Gyorgyi Tuba and Daniel Kontak - Laurentian University</i>

<b>MINERALS I</b>	<b>13:30 - 15:00</b>	<b>ROOM 109</b>
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<b>MIN45: Organizers: Chairs:</b>	<b>Marine Mineral Resources - Prospects and Challenges I</b> Mark Hannington, University of Ottawa; John Jamieson, Memorial University of Newfoundland Amy Gartman, U.S. Geological Survey; Sven Petersen, GEOMAR Helmholtz Centre for Ocean Research Kiel
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**WEDNESDAY, JUNE 20**

- 13:30 - 2471**    **The regulatory framework for marine mineral resource exploration and exploitation in the Area Beyond National Jurisdiction**  
Michael Lodge - International Seabed Authority
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- 13:45 - 2311**    **Marine mineral resources - national and international management**  
*Harald Brekke - Norwegian Petroleum Directorate*
- 
- 14:00 - 2453**    **The Hydrothermal Vent Ecosystem: Is it at Risk?**  
*Verena Tunnicliffe - University of Victoria*
- 
- 14:15 - 2172**    **Detection of Concealed Seafloor Massive Sulfides by New Geophysical Exploration Techniques at Okinawa Trough, Japan**  
*Tetsuro Urabe - Cabinet Office, Government of Japan*
- 
- 14:30 - 2290**    **Russian exploration of seafloor massive sulfides: results and prospects**  
*Georgy Cherkashov - All-Russian Research Institute of Geology and Mineral Resources of the World Ocean*
- 
- 14:45 - 1679**    **Germany's exploration for seafloor massive sulfides in the Indian Ocean**  
*Ulrich Schwarz-Schampera, Ralf Freitag and Hendrik Mueller - Federal Institute for Geosciences and Natural Resources*

**MINERALS II**
**13:30 - 15:00**
**ROOM 110**

- MIN27:**        **Footprints of Giant Orebodies - Mineralogical, Spectral and Geochemical Vectors to Discovery I (AAG: 28th IAGS)**
- Organizers:**    David Cooke, University of Tasmania; Craig Hart and Peter Winterburn, University of British Columbia (UBC)
- Chairs:**        Alexandra Brown, UBC; David Cooke, University of Tasmania; Craig Hart, Robert Lee, Guillaume Lesage and Ryan Shaw, UBC
- 
- 13:30 - 1351**    **Using quartz as a tool to aid vectoring in the lithocap environment - a case study from Mankayan, Philippines**  
*David Richard Cooke - University of Tasmania; Huayong Chen - Chinese Academy of Sciences; Lejun Zhang - University of Tasmania; Zhaoshan Chang - James Cook University; Jennifer Thompson - University of Tasmania; Noel White - Hefei University of Technology*
- 
- 13:45 - 1402**    **Hemlo Au deposit, N. Ontario: chlorite mineral chemistry as a tool for exploring in greenstone terranes**  
*Joseph Vrzovski and Pete Hollings - Lakehead University; David Cooke - University of Tasmania; Emily Gorner - Lakehead University*
- 
- 14:00 - 1470**    **Hydrothermal Apatite geochronology; Implications for porphyry exploration and new mineral potential in the American Southwest**  
*Joshua Phillips, Sebastien Meffre, Jay Thompson and David Cooke - University of Tasmania*
- 
- 14:15 - 1583**    **Tourmaline: A tool for vectoring and fertility assessments in porphyry copper deposits**  
*Francisco Testa, David Cooke, Nathan Fox and Lejun Zhang - University of Tasmania*
- 
- 14:30 - 1848**    **Trace-element characteristics of tourmaline from Canadian Co-Mo-Au porphyry systems**  
*Christopher E. Beckett-Brown and Andrew McDonald - Laurentian University; Beth McClenaghan - Geological Survey of Canada*
- 
- 14:45 - 1494**    **Indicator mineral analysis of stream sediment samples as an exploration tool in an unglaciated vegetated area of east-central Alaska**  
*Karen D. Kelley, Sarah Bala, Garth Graham, Heather Lowers, David Adams and Douglas Kreiner - U.S. Geological Survey; Katharina Pfaff - Colorado School of Mines*

- 15:00 - 1586 **Igneous geochemistry and geochronology of the intrusive rocks of the central Wasatch Mountain Igneous belt, Utah, USA: implications for porphyry miner**  
Emily Smyk - University of Tasmania; Pete Hollings - Lakehead University; Jennifer Thompson, Michael Baker and David Cooke - University of Tasmania

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**MINERALS III** **13:30 - 15:00** **ROOM 111**

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**MIN19: Gold Deposits in Orogenic Belts II**

- Organizers:** Marc Bardoux, Barrick Gold Corporation; Hubert Mvondo, Maple Gold Mines; Luke Ootes, BC Geological Survey; Edmond van Hees, Ministry of Northern Development and Mines  
**Chair:** Marc Bardoux

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13:30 - 1484 **Tectono-metamorphic setting and hydrothermal events in the world-class Amaruq BIF-associated gold deposit, Churchill Province, Nunavut**

*Manon Valette and Stéphane De Souza - Université du Québec à Montréal; Patrick Mercier-Langevin - Geological Survey of Canada (GSC); Olivier Côté-Mantha and Marjorie Simard - Agnico Eagle Mines Ltd.; Vicki McNicoll - GSC; Patrice Barbe - Agnico Eagle Mines Ltd.*

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13:45 - 1260 **Structural and lithological controls on BIF-associated gold: Insights from the Tiriganiau deposit, Meliadine district, Nunavut**

*Brayden St. Pierre - Université du Québec; Patrick Mercier Langevin - Geological Survey of Canada; Michel Malo - Université du Québec; Jean-Claude Blais, Guilhem Servelle, Marjorie Simard and Morgan Hjorth - Agnico Eagle Mines Ltd.*

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14:00 - 1855 **Settings and origins of Paleoproterozoic gold in the Saskatchewan-Manitoba segment of the Trans-Hudson Orogen**

*Ryan Morelli and Ralf Maxeiner - Saskatchewan Geological Survey; Simon Gagne - Manitoba Geological Survey; Gary Delaney - Saskatchewan Geological Survey*

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14:15 - 1768 **The Valentine Lake Gold Camp - Orogenic Gold in the Exploits Subzone of the Newfoundland Appalachians**

*Charles Samson and Graham Layne - Memorial University of Newfoundland; Sherry Dunsworth - Marathon Gold Corp.*

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14:30 - 1821 **The Klaza Au-Ag epithermal deposit – a pristine example of Late Cretaceous gold mineralization in the Dawson Range, Yukon Territories**

*Well-Shen Lee - Mineral Exploration Research Centre (MERC); Jeremy Richards and Daniel Kontak - Laurentian University; John Chapman and Neil Rogers - Geological Survey of Canada; Matt Turner - Rockhaven Resources Ltd.*

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**MINERALS IV** **13:30 - 15:00** **ROOM 114**

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**MIN48: Hydrocarbons in the Exploration for Metaliferous and Non-Metaliferous Deposits (AAG: 28th IAGS)**

- Organizers:** Jeff Jaacks, Geochemical Applications International Inc.; David Seneshen, Geochemical Insight; Peter Winterburn, University of British Columbia (UBC)  
**Chairs:** Pearce Luck, UBC; David Seneshen

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13:30 - 2189 **KEYNOTE: Hydrocarbons, Bugs and Chemistry, Linking Processes**

*Peter Winterburn, Erika Cayer, Rachel Simister, Sean Crowe and Bianca Phillips - University of British Columbia*

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14:00 - 2260 **KEYNOTE: Hydrocarbon and metal anomalies over petroleum and metal deposits**

*David Seneshen - Consultant*

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**WEDNESDAY, JUNE 20**

**14:15 - 2462** **Imaging buried kimberlite and sulfide bodies in northwestern Quebec using hydrocarbons and soil geochemistry**  
 Jamil Sader - Bureau Veritas Commodities Canada Ltd.

**14:30 - 2159** **Subtle geochemical signatures – frontiers in partial extraction and passive soil gas analyses**  
 Ryan Noble - Commonwealth Scientific and Industrial Research Organisation (CSIRO);  
 David Seneshen - Consultant; Ravi Anand and Melvyn Lintern - CSIRO; Brian Townley -  
 University of Chile; Tenten Pinchand - CSIRO

**14:45 - 1346** **Organic geochemistry: a pathfinder in copper porphyry exploration**  
 Pearce Michael Luck, Rachel Chouinard, Shane Rich and Peter Winterburn - University of  
 British Columbia

**MINERALS V 13:30 - 15:00 ROOM 115**

**MIN64: Mine Wastes and the Environment: Contamination, Management and Reclamation II**  
**Organizers:** Heather Jamieson, Queen's University; Matthew Lindsay, University of Saskatchewan;  
 Lesley A. Warren, University of Toronto

**Chairs:** Heather Jamieson; Gerhard Jessen, University of Toronto; Matthew Lindsay; Clare Miller,  
 Queen's University; Sarah Rudderham, University of Saskatchewan; Chris Schuh, Queen's  
 University; Lesley Warren

**13:30 - 2124** **Mount Polley Mine Tailings Dam Embankment Failure: impact, risk assessment and remediation, and challenges of communicating technical information**  
 Colleen Hughes - Mount Polley Mining Corporation

**13:45 - 1459** **Long-term monitoring of waste rock weathering at the Antamina Mine, Peru**  
 Bas Vriens - University of British Columbia; Holly Peterson - Guilford College; Laura  
 Laurenzi - University of British Columbia; Celedonio Aranda - Antamina Minera S.A.; Leslie  
 Smith, Uli Mayer and Roger Beckie - University of British Columbia

**14:00 - 1811** **A case study comparing the results from static and kinetic geochemical tests: Sulphide-bearing iron oxide deposits**  
 Jessica Charles, Rob Bowell, Ruth Warrender and Julien Declercq - SRK Consulting (UK) Ltd.

**14:15 - 2125** **Characterization of deleterious elements from exploration to tailings using micro-XRF and XANES spectroscopy - examples from gold and uranium ore bodies**  
 Lisa Van Loon - LISA CAN Analytical Solutions Inc.; Neil Banerjee - Western University

**14:30 - 2026** **Time Dependent Speciation Changes in In-situ Tailings**  
 Jeff A. Warner - Canadian Light Source

**14:45 - 1913** **Sulfide Oxidation in Mine Waste: Measuring Intra Particle Diffusion Coefficients**  
 Ryan Miller and Tom Al - University of Ottawa

**MINERALS VI 13:30 - 15:00 ROOM 116**

**MIN37: Energy and Technology Metals: Rare Earth Elements, Lithium, and Related Advanced Materials - from Deposit Formation to Mining and Processing VII**

**Organizers:** David Dreisinger, University of British Columbia; Kathryn Goodenough, British Geological  
 Survey and University of Exeter; Heather Jamieson, Queen's University; Frances Wall,  
 University of Exeter

**Chairs:** Paul Alexandre, Brandon University; Greg Andrews, Search Minerals Inc.; Anouk Borst,  
 University of St Andrews; Kathryn Goodenough; Sarah Gordon, Satarla; Heather Jamieson;  
 Volker Moeller, Avalon Advanced Materials Inc.; Paul Nex, University of Witwatersrand;  
 Frances Wall

- 13:30 - 2434** **Characterizing the mineral domains of Li-(Rb-Cs) enrichment at the East Kemptville Sn-(Cu-Zn-Ag) deposit, Nova Scotia, Canada**  
Jacob Hanley and Catherine Sedge - Saint Mary's University; William Mercer - Avalon Advanced Materials Inc.; Daniel Kontak - Laurentian University
- 13:45 - 1492** **Solubilities of wodginite, titanowodginite, microlite, pyrochlore, tantalite-(Mn) and columbite-(Mn) in flux-rich haplogranitic melts**  
*Alysha G. McNeil, Robert L. Linnen and Roberta L. Flemming - Western University*
- 14:00 - 1478** **Critical metals in Pb-Zn ores: Unravelling tectono-metamorphic processes generating Ge mineralization in the Variscan Pyrenean Axial Zone**  
*Alexandre Cugerone, Benedicte Cenki-Tok, Alain Chauvet and Emilien Oliot - Geosciences Montpellier; Stefano Salvi and Didier Beziat - Geosciences Environnement Toulouse; Elisabeth Le Goff - French Geological Survey; Kalin Kouzmanov - University of Geneva; Manuel Munoz - Geosciences Montpellier*
- 14:15 - 1370** **The distribution of germanium in sulphide assemblages from the Prieska and Kipushi mines: preliminary mineralogical studies**  
*Paul Andrew Nex, Caitlin Stewart, Tshilidzi Mudau and Judith Kinnaird - University of the Witwatersrand*
- 14:30 - 1457** **Implications of mineralogical hosts to byproduct critical element recovery**  
*Nadine M. Piatak, Sarah Hayes, Sarah Jane White, Robert Seal and Ryan McAleer - U.S. Geological Survey*
- 14:45 - 1546** **The character and formation of Indium mineralization, East Kemptville, Nova Scotia**  
*Jason Willson and Iain Samson - University of Windsor; Dan Kontak - Laurentian University*

MINERALS I	15:30 - 17:00	ROOM 109
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- MIN45:** **Marine Mineral Resources - Prospects and Challenges II**
- Organizers:** Mark Hannington, University of Ottawa; John Jamieson, Memorial University of Newfoundland
- Chairs:** Amy Gartman, U.S. Geological Survey; Sven Petersen, GEOMAR Helmholtz Centre for Ocean Research Kiel
- 15:30 - 2240** **Deep Marine Mineral Resources in the Atlantic Basin: issues, challenges and goals**  
*Pedro Madureira - Extensão da Plataforma Continental (EMEPC); Filipa Marques - University of Bergen*
- 15:45 - 2147** **Global diversity among deep-ocean mineral deposits**  
*Amy Gartman and Jim Hein - U.S. Geological Survey; Kira Mizell - U.S. Geological Survey and University of California, Santa Cruz*
- 16:00 - 2212** **Out of Our Depth: Comparing Deep Sea versus Terrestrial Mineral Resources**  
*Gavin M. Mudd - RMIT University; Simon Jowitt - University of Nevada, Las Vegas; Craig Styan - University of South Australia; Charles Roche - Mineral Policy Institute*
- 16:15* *Panel Discussion*

MINERALS II	15:30 - 17:00	ROOM 110
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- MIN27:** **Footprints of Giant Orebodies - Mineralogical, Spectral and Geochemical Vectors to Discovery II (AAG: 28th IAGS)**
- Organizers:** David Cooke, University of Tasmania; Craig Hart and Peter Winterburn, University of British Columbia (UBC)
- Chairs:** Alexandra Brown, UBC; David Cooke; Craig Hart, Guillaume Lesage and Ryan Shaw, UBC


**WEDNESDAY, JUNE 20**

- 15:30 - 1873 Testing Airborne Hyperspectral Surveying for Mineral Exploration at High Latitudes: A Pilot Study over Porphyry Cu deposits, eastern Alaska Range, Alaska, USA**  
 Garth E. Graham, Raymond Kokaly, Karen Kelley, Todd Hoefen and Michaela Johnson - U.S. Geological Survey
- 
- 15:45 - 1355 NIR Characteristics of Porphyry Copper Deposits**  
*Nicholas H. Jansen - Quantum Pacific  
 Exploration Chile Ltd.; McLean Trott - First Quantum Minerals Ltd.*
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- 16:00 - 1405 Extending the exploration footprint at Canadian Malartic, QC, through the integration of hyperspectral imaging and petrography of glacial clasts**  
*Caroline Taylor and Martin Ross - University of Waterloo; Stephane Perrouy - Laurentian University; Philip Lypaczewski and Benoit Rivard - University of Alberta; James R. Clark - McGill University; Gema Olivo - Queen's University; Robert Linnen - Western University; Robin Taves - University of Waterloo*
- 
- 16:15 - 2133 Plio-Pleistocene High-Sulfidation Epithermal Gold Mineralization at the La Bodega and La Mascota Deposits, Eastern Cordillera of Colombia**  
*Alfonso Luis Rodriguez Madrid - Apex Geoscience Ltd.; Thomas Bissig - Goldcorp; Craig Hart - University of British Columbia; Luis Mantilla Figueroa - Universidad Industrial de Santander*
- 
- 16:30 - 1525 Ore Pathfinders and Fertility Assessments in Lithocaps: a Case Study of the Veladero High-Sulfidation Epithermal Au-Ag deposit, Argentina**  
*Lejun Zhang, Noel White and David Cooke - University of Tasmania; Huayong Chen - Guangzhou Institute of Geochemistry; Francisco Testa - University of Tasmania; Aldo Vásquez and Simon Griffiths - Barrick Gold Corporation; Jennifer Thompson and Mike Baker - University of Tasmania*
- 
- 16:45 - 1412 The geochemistry of the alteration of the Red Lake Gold Mines Au deposit**  
*Nicolas Derome and Peter Hollings - Lakehead University; David Cooke, Michael Baker and Evan Orovan - University of Tasmania*

**MINERALS III 15:30 - 17:00 ROOM 111**
**MIN62: Innovations in Tailings Management and Utilization I**

**Organizers:** Greg Dipple, University of British Columbia (UBC); Ian Power, Trent University; Dirk Van Zyl, UBC

**Chairs:** Greg Dipple; Ian Power

- 15:30 - 2185 KEYNOTE: Mining Value from Waste – Developing a Long Term Collaborative Effort to Develop and Demonstrate Innovative Tailings Reprocessing Technologies**  
*Bryan Tisch, Terry Cheng, Rory Cameron and Janice Zinck - Natural Resources Canada*

- 16:00 - 1505 A circular economy classification of mine waste**  
*Bruno Lemiere - French Geological Survey*

- 16:15 - 1665 The New Paradigm towards Sustainable Rehabilitation of Metal Mine Tailings - Recent Progress and Emerging Technology**  
*Longbin Huang, Yunjia Liu and Fang You - University of Queensland*

- 16:30 - 2143 Developing a process to recover rare earth elements and scandium from coal fly ash**  
*Rory Cameron and Yves Thibault - CanmetMINING; Larry Lien - Membrane Development Specialists; Bill Hayward - WT&C Innovates; Rolando Lastra and John Chaulk - CanmetMINING*

- 16:45 - 2445 Mining to mitigate climate change**  
*Gregory Dipple and Kate Carroll - University of British Columbia; Ian Power - Trent University; Sterling Vanderzee and Bart De Baere - University of British Columbia*

MINERALS IV		15:30 - 17:00	ROOM 114
<b>MIN42:</b>	<b>Classification of Anthropogene Resources</b>		
<b>Organizers:</b>	Soraya Heuss-Assbichler, Ludwig-Maximilian Universität München; Julia Stegemann, University College London; Patrick Waeger, Swiss Federal Laboratories for Materials Science and Research (Empa); Andrea Winterstetter, Flemish Institute for Technological Research		
<b>Chair:</b>	Andrea Winterstetter		
<b>15:30 - 1536</b>	<b>Applying the United Nations Framework Classification (UNFC) to Anthropogenic Resources</b>		
	<i>Soraya Heuss-Assbichler - Ludwig-Maximilian Universität München; Ulrich Kral - Technische Universität Wien; Julia Stegemann - University College London; Patrick Waeger - Swiss Federal Laboratories for Materials Science and Research (Empa); Andrea Winterstetter - Flemish Institute for Technological Research (VITO)</i>		
<b>15:45 - 1041</b>	<b>Evaluating the secondary resource potential of Chromium rich slags from stainless steel production</b>		
	<i>Andrea Winterstetter, Dirk Nelen, Jeroen Spooren, Mieke Quaghebeur and Karl Vrancken - Flemish Institute for Technological Research (VITO)</i>		
<b>16:00 - 2193</b>	<b>Sustainable raw material criticality assessment as a guideline for companies focusing on social risks</b>		
	<i>Andrea Thorenz and Christoph Kolotzek - University of Augsburg</i>		
<b>16:15 - 2339</b>	<b>Prospecting Secondary Raw Materials in the Urban Mine and Mining Wastes (ProSUM)</b>		
	<i>Patrick Waeger and Amund Loevik - Swiss Federal Laboratories for Materials Science and Research (Empa); Daniel Cassard - French Geological Survey; Perrine Chanceler - Technische Universität Berlin; Sarah Downes - WEEE Forum; Anders Hallberg - Geological Survey of Sweden; Pascal Leroy - WEEE Forum; Maria Ljunggren Söderman - Chalmers University of Technology; Vera Susanne Rotter - Technische Universität Berlin; Jaco Huisman - United Nations University</i>		
<b>16:30 - 1818</b>	<b>Classifying anthropogenic resources: the case of waste co-processing in cement kilns</b>		
	<i>Stijn van Ewijk and Julia Stegemann - University College London</i>		
<b>16:45 - 1034</b>	<b>Decentralized Sewage as Enduring Anthropogenic Resource for Phosphorus</b>		
	<i>E. Craig Jowett - Waterloo Biofilter Systems Inc.</i>		
MINERALS V		15:30 - 17:00	ROOM 115
<b>MIN26:</b>	<b>Towards Big Data: Applications of Data Analytics in Geochemistry III (AAG: 28th IAGS)</b>		
<b>Organizers:</b>	Eric Grunsky, Consultant; Pim van Geffen, Vancouver Geochemistry; Peter Winterburn, University of British Columbia		
<b>Chairs:</b>	Britt Bluemell, Bonanza Geosciences; Eric Grunsky; David Lawie, IMDEX, Australia; Samantha Scher, Corescan, Chile; Cliff Stanley, Acadia University; Pim van Geffen		
<b>15:30 - 1333</b>	<b>Using regional geochemistry for environmental monitoring and risk assessment</b>		
	<i>Jennifer McKinley - Queens University Belfast</i>		
<b>15:45 - 1378</b>	<b>Recognition of geochemical anomalies based on RPCA and GWR across the boundary areas of China and Mongolia</b>		
	<i>Mi Tian - Chinese Academy of Geological Sciences</i>		
<b>16:00 - 1017</b>	<b>Pareto-lognormal modeling of worldwide size-frequency distributions for copper and other metals primarily mined from hydrothermal ore deposits</b>		
	<i>Frits Agterberg - Geological Survey of Canada</i>		
<b>16:15</b>	<i>Panel Discussion</i>		



WEDNESDAY, JUNE 20

MINERALS VI	15:30 - 17:00	ROOM 116
<b>MIN37:</b>	<b>Energy and Technology Metals: Rare Earth Elements, Lithium, and Related Advanced Materials - from Deposit Formation to Mining and Processing VIII</b>	
<b>Organizers:</b>	David Dreisinger, University of British Columbia; Kathryn Goodenough, British Geological Survey and University of Exeter; Heather Jamieson, Queen's University; Frances Wall, University of Exeter	
<b>Chairs:</b>	Paul Alexandre, Brandon University; Greg Andrews, Search Minerals Inc.; Anouk Borst, University of St Andrews; Kathryn Goodenough; Sarah Gordon, Satarla; Heather Jamieson; Volker Moeller, Avalon Advanced Materials Inc.; Paul Nex, University of Witwatersrand; Frances Wall	
<b>15:30 - 1597</b>	<b>Recovery of cobalt from lateritic deposits – detailed mineral chemistry implications for development of novel extraction strategies</b> <i>Richard Herrington, Agnieszka Dybowska, Paul Schofield and Rachel Norman - Natural History Museum; Fred Mosselmans - Diamond Light Source</i>	
<b>15:45 - 2410</b>	<b>XRD-Raman-HRTEM characterization of the nano-scale structure of Albany graphite: with implications on deposit genesis and mineral beneficiation</b> <i>Andrew Conly - Lakehead University</i>	
<b>16:00 - 1885</b>	<b>Polymetallic nodules as a source for critical metals (REY, Co)</b> <i>Wycliff Tupiti, Arjan Dijkstra and Colin Wilkins - Plymouth University</i>	
<b>16:15 - 1087</b>	<b>Germany's base metal ore deposits and their potential for HT elements: Trace and minor element variations in sulfides from the Ruhr district</b> <i>Soeren Henning, Torsten Graupner, Thomas Krassmann, Hans-Eike Gaebler and Simon Goldmann - Federal Institute for Geosciences and Natural Resources; Peter Onuk - Montanuniversität Leoben</i>	
<b>16:30 - 1859</b>	<b>Microthermometric behavior of polyphase inclusions from the Jiajika lithium deposit, China: Insights into the composition of late stage fluids</b> <i>Alan Anderson - St. Francis Xavier University</i>	
<b>16:45 - 2321</b>	<b>Identifying environmental supply risks of recycled Rare Earth Elements using Life Cycle Assessment</b> <i>Dieuwertje Schrijvers and Guido Sonnemann - University of Bordeaux</i>	



MINERALS I		08:30 - 10:00	ROOM 109
<b>MIN33:</b>	<b>Mineral Exploration under Glaciated Cover: New Tools, Trends, and Discoveries I</b>		
<b>Organizers:</b>	Beth McClenaghan, Roger Paulen and Alain Plouffe, Geological Survey of Canada (GSC); Pertti Sarala, Geological Survey of Finland		
<b>Chairs:</b>	Roger Paulen; Alain Plouffe; Pertti Sarala		
<b>08:30 - 2455</b>	<b>Quantitative Interpretation of Indicator Dispersal: Erosion Length Scale as the First Order Control</b> <i>Phillip Larson - Vesterheim Geoscience PLC</i>		
<b>08:45 - 1577</b>	<b>Surficial geochemical and mineralogical signature of low to massive sulphide, Ni-Cu-PGE deposits in glaciated terrain</b> <i>Sarah Hashmi - Queen's University; Andy Bajc - Ontario Geological Survey; Matt Leybourne - Queen's University; Stewart Hamilton - Ontario Geological Survey</i>		
<b>09:00 - 1549</b>	<b>The relationship of mercury in till to regional fault structures in the Interior Plateau, Central British Columbia, Canada</b> <i>Ray E. Lett - Geochemist; Karin Öberg - Consultant</i>		
<b>09:15 - 1388</b>	<b>A review on the trace elements composition of Fe-oxides: implications for their use as indicator minerals in exploration</b> <i>Émilie Bédard, Sheida Makvandi, Georges Beaudoin and Laurène-Marie Wavrant - Université Laval</i>		
<b>09:30 - 1503</b>	<b>A novel approach using detrital apatite and till geochemistry to identify covered mineralization in the Interior Plateau, British Columbia</b> <i>Alexei S. Rukhlov and Mao Mao - BC Geological Survey; Stephen M. Rowins - BC Geological Survey and University of Victoria; Adrian S. Hickin, Travis Ferbey and Aaron Bustard - BC Geological Survey; Jody Spence and Laurence A. Coogan - University of Victoria</i>		
MINERALS II		08:30 - 10:00	ROOM 110
<b>MIN29:</b>	<b>Exploration Undercover - Techniques, Technology and Strategy I (AAG: 28th IAGS)</b>		
<b>Organizers:</b>	Ryan Noble, CSIRO Mineral Resources; Peter Winterburn, University of British Columbia		
<b>Chairs:</b>	Matthew Bodnar, CSA Global; Erica Cayer, Klondyke Gold Corp.; Ryan Noble; Peter Winterburn		
<b>08:30 - 1418</b>	<b>Direct Detection of Drift Concealed Kimberlites using Surface Geochemistry and Landscape Evolution, NWT, Canada</b> <i>Erika Mary Cayer and Peter Winterburn - University of British Columbia; Barrett Elliott - Northwest Territories Geological Survey</i>		
<b>08:45 - 1468</b>	<b>Surface Till Geochemical Exploration of a Concealed Kimberlite</b> <i>Andrew Prior Wickham and Peter Winterburn - University of British Columbia; Barrett Elliott - Northwest Territories Geological Survey</i>		
<b>09:00 - 1040</b>	<b>Geochemical Mapping of the Deerhorn Copper-Gold Porphyry Deposit and Associated Alteration through Transported Cover, Central British Columbia</b> <i>Shane Rich and Peter Winterburn - University of British Columbia</i>		
<b>09:15 - 1109</b>	<b>Tracing fault-controlled fluids in areas of cover using regolith and spinifex chemistry, with implications for stratabound Pb-Zn mineralization</b> <i>Paul Morris - Geological Survey of Western Australia</i>		
<b>09:30 - 1658</b>	<b>The Geochemical Anomaly Pattern of the Shizishan Cu-Mo-Au Ore Field in Tongling Region, Anhui Province, China</b> <i>Mingjie Xi, Shengming Ma and Shuqi Hu - Chinese Academy of Geological Sciences</i>		


**THURSDAY, JUNE 21**

09:45 - 1324 **Mapping and Modeling Geochemical Dispersion Above a Till concealed Polymetallic Volcanogenic Massive Sulphide Deposit**  
 Matthew Alan Bodnar and Peter Winterburn - University of British Columbia

**MINERALS III 08:30 - 10:00 ROOM 111**

**MIN64: Mine Wastes and the Environment: Contamination, Management and Reclamation III**  
**Organizers:** Heather Jamieson, Queen's University; Matthew Lindsay, University of Saskatchewan; Lesley A. Warren, University of Toronto

**Chairs:** Heather Jamieson; Gerhard Jessen, University of Toronto; Matthew Lindsay; Clare Miller, Queen's University; Sarah Rudderham, University of Saskatchewan; Chris Schuh, Queen's University; Lesley Warren

08:30 - 1266 **Geochemical controls on trace-metal mobility in oil sands fluid petroleum coke deposits**  
*Jared M. Robertson; Jake A. Nesbitt, Lawrence A. Swerhone, Mojtaba Abdolhazehad and Matthew B.J. Lindsay - University of Saskatchewan*

08:45 - 1305 **Geochemistry and geomicrobiology of fluid fine tailings in an oil sands end pit lake**  
*Sarah Rudderham, Qingyang Liu, Joyce McBeth and Matthew Lindsay - University of Saskatchewan*

09:00 - 1429 **The interplay of physical and biogeochemical processes determining water cap oxygen concentrations within Base Mine Lake, the first oil sands commercial pit lake**  
*Lesley A. Warren - University of Toronto; Florent Risacher, Patrick Morris and Daniel Arriaga - McMaster University; Gerhard Jessen - University of Toronto; Jiro Mori - McMaster University; Tara Colenbrander Nelson - University of Toronto; Greg Slater - McMaster University*

09:15 - 2040 **Elucidating the relationship of geochemistry and microbes in Canada's first oil sands pilot pit lake**  
*Gerhard L. Jessen, Jiro Mori and Tara Colenbrander-Nelson - University of Toronto; Viola Krukenberg and Roland Hatzepichler - Montana State University; Gregory F. Slater - McMaster University; Lesley A. Warren - University of Toronto*

09:30 - 2499 **KEYNOTE: From concept to operation: The journey of genomic applications in environmental processes at Teck Resources Ltd.**  
*Jorge Clemente Miranda-Trevino - Teck Metals Ltd.*

**MINERALS IV 08:30 - 10:00 ROOM 114**

**MIN53: Quantitative Mineralogy: Application in Mineral Exploration**  
**Organizers and Chairs:** Réjean Girard, IOS Services Géoscientifiques; Chris Hamilton, SFR Corporation

08:30 - 2072 **Automated Mineralogy of <0.25 mm Heavy Mineral Concentrates: New Approaches for Mineral Exploration**  
*Hugh Donald Loughheed and Dan Layton-Matthews - Queen's University; Beth McClenaghan - Geological Survey of Canada*

08:45 - 2013 **A simple approach to the classification of minerals from heavy mineral concentrates using off-line macros to process energy dispersive x-ray data**  
*Dave Crabtree and Sandra Clarke - Ontario Geological Survey*

09:00 - 2059 **Automated and Quantitative Petrography: Applications of new Advances in X-Ray Mapping and Image Processing**  
*Philippe Pagé, Réjean Girard and Jonathan Tremblay - IOS Services Géoscientifiques Inc.*



## THURSDAY, JUNE 21

- 09:15 - 1969 **ARTMin: Automated SEM-based indicator minerals detection from heavy mineral concentrates using fully-deconvoluted EDS analyses**  
Jonathan Tremblay, Réjean Girard and Alexandre Néron - IOS Services Géoscientifiques Inc.
- 09:30 - 1557 **New Textural and Quantitative Capabilities of Automated Mineralogy in Mineral Exploration & Geometallurgy: case studies from the Munalí Ni mine**  
Shaun David Graham - Carl Zeiss; David Holwell and Laura Ward - University of Leicester
- 09:45 - 1944 **PCA of Fe oxides MLA data as a provenance discrimination tool: Case study from bedrock and till from the Kiggavik U district (Nunavut, Canada)**  
Sheida Makvandi and Georges Beaudoin - Université Laval; David Quirt and Patrick Ledru - Areva Resources Canada; Beth McClenaghan - Geological Survey of Canada
- 10:00 - 1970 **Gold grain counting at the micron scale: Reducing sample size for gold exploration in glaciated terrain**  
Alexandre Néron and Réjean Girard - IOS Services Géoscientifiques Inc.; Paul Bédard - Université du Québec à Chicoutimi

**MINERALS V****08:30 - 10:00****ROOM 115**

- MIN19: Gold Deposits in Orogenic Belts III**  
**Organizers:** Marc Bardoux, Barrick Gold Corporation; Hubert Mvondo, Maple Gold Mines; Luke Ootes, BC Geological Survey; Edmond van Hees, Ministry of Northern Development and Mines  
**Chair:** Marc Bardoux
- 08:30 - 2336 **Timing and genesis of the Shanggong lode gold deposit in southern North China Craton: no correlation with orogenic deformation**  
Shaorui Zhao and Jianwei Li - China University of Geosciences; David R Lentz - University of New Brunswick
- 08:45 - 1620 **KEYNOTE: Fluid and metal sources for the Jiaodong giant gold province: Link to metasomatized lithospheric mantle**  
Jun Tan and David Lentz - University of New Brunswick
- 09:15 - 1616 **Ore-controlling structural model for the Jiaodong gold deposits, eastern China**  
Ruihong Li, Xueqiu Wang, Qingqing Liu and Qinghua Chi - Chinese Academy of Geological Sciences
- 09:30 - 1094 **Southwest Kyrgyz Republic: ANew Frontier for Carlin-type Gold Deposits**  
Douglas Kirwin - Real Gold Corp.; Jean Cline - Consultant; Alexander Becker - Consultant; Iaroslav Bandaruk - Consultant; Brian Lueck - Consultant
- 09:45 - 1247 **Misnamed rocks impede exploration**  
Peter Bernard Schwann - Aruma Resources Limited
- 10:00 - 1490 **Nature and origin of ore-forming fluids associated with BIF-hosted gold mineralization in the Kraaipan-Amalia greenstone belt, South Africa**  
Napoleon Quaye Hammond - University of Limpopo; Kofi Adomako-Ansah, Daizo Ishiyama, Masatsugu Yamamoto and Toshio Mizuta - Akita University; Yuichi Morishita - Shizuoka University

**MINERALS VI****08:30 - 10:00****ROOM 116**

- MIN50: Mineral Prospectivity Modeling and Assessment of Undiscovered Mineral Resources IV**  
**Organizers:** John Carranza, University of KwaZulu-Natal; Jeff Harris, Geological Survey of Canada; Vesa Nykänen, Geological Survey of Sweden; Renguang Zuo, China University of Geosciences  
**Chairs:** John Carranza; Vesa Nykänen; Mana Rahimi, University of British Columbia; Renguang Zuo


**THURSDAY, JUNE 21**

- 08:30 - 1631 **KEYNOTE: Mineral Potential Mapping for Land Management and Exploration Decision Making: A Case Study from the Southern New England Orogen**  
Arianne Ford, K.J. Peters and G.A. Partington - Kenex Pty Ltd; P.L. Blevin and P.M. Downes - Geological Survey of New South Wales
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- 09:00 - 1055 **How many undiscovered hydrothermal copper-gold prospects are there in Catanduanes (Philippines)?**  
*Emmanuel John Carranza - University Of KwaZulu-Natal*
- 
- 09:15 - 1778 **Potential for undiscovered Sb and W resources in continental France, a first pilot study**  
*Guillaume Bertrand - French Geological Survey and Institut des Sciences de la Terre d'Orléans; Jean-Michel Angel - French Geological Survey; Luc Barbanson - Institut des Sciences de la Terre d'Orléans; Mario Billa - Independent Expert; Florent Cheval-Garabédian - Institut des Sciences de la Terre d'Orléans; Eric Gloaguen - French Geological Survey and Institut des Sciences de la Terre d'Orléans; Catherine Greffier - French Geological Survey; Matthieu Harlaux - University of Geneva; Elisabeth Le Goff and Jérémie Melleton - French Geological Survey*
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- 09:30 - 1061 **KEYNOTE: Comparison of Canadian with worldwide metal size-frequency distributions for copper, zinc, gold and silver**  
*Frits Agterberg - Geological Survey of Canada*

**MINERALS I**
**10:30 - 12:00**
**ROOM 109**

- MIN24:** **Stable and Radiogenic Isotope Systems: Applications in Exploration and the Environment I (AAG: 28th IAGS)**
- Organizers:** Shaun Barker, University of Waikato; Mathew Leybourne, Laurentian University; Peter Winterburn, University of British Columbia
- Chairs:** Shaun Barker; Mathew Leybourne
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- 10:30 - 2446 **Integrating Stable Isotope Analysis with Mineral Exploration to Image Hydrothermal Systems**  
*Gregory Dipple - University of British Columbia; Shaun Barker - University of Waikato; Ken Hickey - University of British Columbia; Ben Andrew - University of Waikato*
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- 10:45 - 2023 **Revealing the thermal structure of ore deposits using clumped carbon and oxygen isotopes**  
*Shaun Barker, John Mering and Ben Andrew - University of Waikato; Gregory Dipple - University of British Columbia; Kate Huntington and Andrew Schauer - University of Washington; Stuart Simmons - University of Utah*
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- 11:00 - 1670 **Stable Isotopes as an Exploration Tool: Tracking Cryptic Alteration Surrounding the Iscaycruz Zn (Pb-Cu-Ag) Skarn-CRD deposit, Central Peru**  
*Samuel Frank Cantor, Craig Hart and Gregory Dipple - University of British Columbia; Abraham Escalante - Glencore; James Mortensen - University of British Columbia*
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- 11:15 - 1506 **Defining the Carbonate Alteration Footprint of the Cortez Hills Carlin-Type Gold Deposit, Nevada Using <sup>13</sup>C and <sup>18</sup>O Stable Isotopes and Geochemistry**  
*Christopher Herron, Gregory Dipple and Kenneth Hickey - University of British Columbia; Andreas Beinlich - University of Curtin*
- 
- 11:30 - 1364 **New Isotopic and Thermal Constraints for Fluid Flow during Copper Mineralisation, Mount Isa, Australia**  
*Benjamin S. Andrew, Shaun Barker and John Mering - University of Waikato; Kate Huntington and Andrew Schauer - University of Washington; Peter Rae - Glencore; Gregory Dipple - University of British Columbia*



THURSDAY, JUNE 21

11:45 - 1841 **Geochemical anomalies in till: Copper isotopes in process evaluation**  
Peter Winterburn, Marghaleray Amina, Matthew Bodnar, Rachel Chouinard, and Shane Rich  
- University of British Columbia

**MINERALS II** **10:30 - 12:00** **ROOM 110**

**MIN29:** **Exploration Undercover - Techniques, Technology and Strategy II (AAG: 28th IAGS)**  
**Organizers:** Ryan Noble, CSIRO Mineral Resources; Peter Winterburn, University of British Columbia  
**Chairs:** Matthew Bodnar, CSA Global; Erica Cayer, Klondyke Gold Corp.; Ryan Noble;  
Peter Winterburn

10:30 - 2022 **Detecting the Teena zinc-lead shale hosted massive sulfide deposit: Surficial geochemistry in a mineral system context**  
Iain James Dalrymple - Teck Resources Limited

10:45 - 1096 **Testing ultrafine soils to improve near surface exploration through cover**  
Ryan Noble - Commonwealth Scientific and Industrial Research Organisation (CSIRO)

11:00 - 1348 **Use of cover sequence geochemistry from regional and mineralisation-associated datasets to understand element transport mechanisms: Case study of the Eromanga Basin (Australia)**  
Eline Baudet - Future industries institute (FII) and University of South Australia  
Caroline Tiddy - and David Giles - FII  
Steve Hill - Geological Survey of South Australia

11:15 - 1395 **Exploration geochemistry: comparison between classic trace elements geochemistry, soil partial leaches, portable XRF, on soils and biogeochemistry in Western Europe Environment. Example from Li-Ta-Sn and W deposits**  
J r mie Melleton, Bruno Lemi re, Virginie Derycke, Anne-Sophie Serrand, Eric Fournier, Eric Gloaguen, Fr d ric Lacquement and Pascal Auger - French Geological Survey  
Maarit Middleton and Vesa Nyk nen - Geological Survey of Finland

11:30 - 1614 **Physical and chemical interfaces and indicator minerals for characterising and detecting the footprints of ore deposits in areas of deep cover**  
Ravi Anand, Walid Salama and Mel Lintern - Commonwealth Scientific and Industrial Research Organisation (CSIRO)

11:45 - 1763 **Reduced chimneys: new perspectives on their formation and relevance to mineral exploration**  
Stewart Hamilton - Ontario Geological Survey  
Konstantin von Gunten - University of Alberta

**MINERALS III** **10:30 - 12:00** **ROOM 111**

**MIN64:** **Mine Wastes and the Environment: Contamination, Management and Reclamation IV**  
**Organizers:** Heather Jamieson, Queen's University; Matthew Lindsay, University of Saskatchewan; Lesley A. Warren, University of Toronto  
**Chairs:** Heather Jamieson; Gerhard Jessen, University of Toronto; Matthew Lindsay; Clare Miller, Queen's University; Sarah Rudderham, University of Saskatchewan; Chris Schuh, Queen's University; Lesley Warren

10:30 - 1269 **Restoration of River Systems Following Mine Tailings Dam Failures: A Generic Approach**  
Karen Hudson-Edwards - University of Exeter; Patrick Byrne - Liverpool John Moores University; Graham Bird - Bangor University; Mark Macklin - University of Lincoln; Tom Matthews - Liverpool John Moores University; Paul Brewer - Aberystwyth University; Richard Williams - University of Glasgow


**THURSDAY, JUNE 21**

**10:45 - 1303 Routing Simulation of Tailings Dam Failure**  
Kun Wang - University of Exeter; Peng Yang - Beijing Union University; Karen Hudson-Edwards - University of Exeter

**11:00 - 1914 Overcoming the Challenges Associated with European Hazardous Assessment of Mining Waste**  
Melanie Cox, Carl Williams and David Tait - SRK Consulting (UK) Ltd.

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**MINERALS IV** **10:30 - 12:00** **ROOM 114**


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**MIN22: Secondary Processes on Ores: From Sugergene Enrichment to Element Dispersion**  
Organizers and Chairs: Thomasa Bissig, Goldcorp; Danae Voormeij, Mynah Exploration Inc.

**10:30 - 1700 The role of the depositional environment in sediment-hosted exotic-Cu mineralization in arid regions: Implications for exploration strategies**  
Alberto Fernández-Mort - Universidad Católica del Norte; Thomas Bissig - Goldcorp Inc; Eduardo Campos and Rodrigo Riquelme - Universidad Católica del Norte; Ana María Alonso-Zarza - Universidad Complutense de Madrid

**10:45 - 1329 Supergene gold nugget accretion at a regional unconformity alteration zone, New Zealand**  
David Craw and Gemma Kerr - University of Otago

**11:00 - 1800 Germanium enrichments in supergene nonsulfide zinc deposits: the Cristal example (Bongará, northern Peru)**  
Nicol Mondillo - Università degli Studi di Napoli Federico II; Richard Herrington - Natural History Museum; Maria Boni and Giuseppe Arfè - Università degli Studi di Napoli Federico II

**11:15 - 1058 (U-Th)/He dating of goethite from the gossan of Moroccan supergene ore deposits**  
Michèle Verhaert - University of Namur; Cécile Gautheron - Université Paris-Sud; Alain Bernard - Université Libre de Bruxelles; Johan Yans - Université de Namur

**11:30 - 1787 The Wingellina (Western Australia) oxide-type laterite deposit: mineralogical association and Ni-Co deportment**  
Francesco Putzolu, Giuseppina Balassone and Maria Boni - Università degli Studi di Napoli Federico II; Max Maczuras - Metals X Ltd.; Nicola Mondillo - Università degli Studi di Napoli Federico II; Jens Najorka - The Natural History Museum; Franco Pirajno - University of Western Australia

**11:45 - 2406 Hypogene enrichment in the Tiegelongnan porphyry-epithermal Cu (Au) deposit, Tibet, China**  
Chao Yang and Georges Beaudoin - Université Laval; Juxing Tang - Chinese Academy of Geological Sciences

**12:00 - 1532 Thermoelectric properties of pyrites and Metallogenic Regularity of Yuku Mo Deposit, Henan Province, China**  
Wenjuan Jia – and Gongwen Wang - China University of Geosciences, Beijing

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**MINERALS V** **10:30 - 12:00** **ROOM 115**


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**MIN6: New Developments in Canadian Diamond Exploration - Finding the Next Generation of Diamond Deposits**  
Organizer and Chair: Barrett Elliott, Northwest Territories Geological Survey

10:30 - 1934	<b>Revitalizing diamond exploration in the Slave Geological Province: A case study in the Northwest Territories, Canada</b> Barrett Elliott - Northwest Territories Geological Survey; Martin Ross and Samuel Kelley - University of Waterloo; Don Cummings - DCGeo Applied Sedimentary Geology Consulting; Peter Winterburn - University of British Columbia; Brent Ward - Simon Fraser University; Bernd Milkereit and Hernan Ugalde - University of Toronto; Michelle Tappert - Hyperspectral Intelligence Inc.; Claire Samson - Carleton University; Asif Mirza - Northwest Territories Geological Survey
10:45 - 1814	<b>Recognizing unique depositional environments and post-depositional modification to sediments in Northwest Territories: implications for drift prospect</b> Dave Sacco and Robin McKillop - Palmer Environmental Consulting Group
11:00 - 2237	<b>Effect of variable ice flow and bedrock topography on dispersal of kimberlitic material from two kimberlite pipes in the Northwest Territories</b> Martin Ross and Samuel Kelley - University of Waterloo; Philippe Normandeau and Barrett Elliott - Northwest Territories Geological Survey
11:15 - 1580	<b>Experimental attrition of mantle minerals: Implications for ascent and eruption of kimberlite</b> David Sasse and Kelly Russell - University of British Columbia; Thomas Jones - Durham University
11:30 - 1582	<b>Remote Sensing and High-Resolution Dem Data Integration of Slave Province Kimberlites, NWT</b> Alex Furlan and Hernan Ugalde - University of Toronto; Bill Morris - McMaster University; Bernd Milkereit - University of Toronto; Asif Mirza and Barrett Elliott - Northwest Territories Geological Survey
11:45 - 1226	<b>Airborne MAG/EM Data Integration of Slave Province Kimberlites, NWT</b> Hernan Ugalde - Brock University Alex Furlan - University of Toronto; Bill Morris - McMaster University; Bernd Milkereit - University of Toronto; Asif Mirza and Barrett Elliott - Northwest Territories Geological Survey

MINERALS VI		10:30 - 12:00	ROOM 116
MIN66:	<b>Isotope Geochemistry in a Mineral Systems Framework: Analytical and Application Advances</b>		
Organizers and Chairs:	Steve Hollis, University College Dublin; Crystal Laflamme, University of Western Australia		
10:30 - 2034	<b>Do you trust your Nd isotopic ratios?</b> Evelyn Freres and Dominique Weis - University of British Columbia; Karla Newman - Trent University; Marghaleray Amini and Kathy Gordon - University of British Columbia		
10:45 - 2479	<b>Lithium isotopes as a tool to characterize weathering regimes in mixed lithology basins</b> Sarina Cotroneo and Lindsay Reynolds - University of Ottawa; Isabelle Girard - Geological Survey of Canada; Clément Bataille and Ian Clark - University of Ottawa		
11:00 - 1938	<b>Isotopic study of halos around Irish-type Zn-Pb orebodies: metallogenetic and exploration implications</b> Julian Menuge - University College Dublin; Steve Hollis - University College Dublin and Geological Survey Ireland; Lola Yesares, Aileen Doran and John Guven - University College Dublin; Freya Marks - Midland Valley Exploration Ltd.; Damien Gagnevin - University College Dublin; Adrian Boyce - Scottish Universities Environmental Research Centre		


**THURSDAY, JUNE 21**

- 11:15 - 1956 Detailed petrographic and isotopic studies (S, Pb) of high-grade Zn-Pb mineralization in the Island Pod orebody, Lisheen deposit, Ireland**  
Aileen L. Doran, Steve P. Hollis, Julian F. Menuge and John Guven - University College Dublin; Adrian J. Boyce - Scottish Universities Environmental Research Centre; Steven J. Piercy - Memorial University of Newfoundland; Oakley Turner - University College Dublin
- 11:30 - 1256 Clumped C-O isotope temperature constraints for carbonate precipitation associated with Irish-type Zn-Pb orebodies**  
Steve Hollis, Aileen Doran and Julian Menuge - University College Dublin; Paul Dennis - University of East Anglia; Brett Davidheiser-Kroll - University of Colorado Boulder; Alina Marca - University of East Anglia; Jamie Wilkinson - Natural History Museum London; Adrian Boyce - Scottish Universities Environmental Research Centre; John Guven - University College Dublin
- 11:45 - 2016 Examining geochemical links between mineralizing fluids in S. Irish copper deposits and the Irish Midlands Zn-Pb field**  
Sean Johnson and Juergen Lang - University College Dublin; Patrick Meere and Richard Unitt - University College Cork; Roisin Kyne, Steve Hollis and Lingli Zhou - University College Dublin
- 12:00 - 2132 Spatially-constrained sulfur isotopes highlight processes controlling sulfur cycling in the near surface of the Iheya North hydrothermal system**  
Crystal LaFlamme - University of Western Australia

**MINERALS VII**
**10:30 - 12:00**
**ROOM 117**

- MIN62: Innovations in Tailings Management and Utilization II**  
**Organizers:** Greg Dipple, University of British Columbia (UBC); Ian Power, Trent University; Dirk Van Zyl, UBC  
**Chairs:** Greg Dipple; Ian Power
- 10:30 - 1954 Uranium Tailings Research at the McClean Lake Mine (Northern Saskatchewan)**  
Kebbi Hughes, John Rowson, Ryan Frey and Caitlin Brown - AREVA Resources Canada Inc. Blanchard Peter - Canadian Light Source
- 10:45 - 2457 From Greenfields to the Post-Mining Landscape: A Planning Approach to Better Mine Closure**  
Julian McGreevy and Brent Mooder - BGC Engineering Inc.; Gord McKenna - McKenna Geotechnical Inc.; Monica Anshah-Sam - Canadian Natural Resources Limited
- 11:00 - 2186 KEYNOTE: Fast-growing willows and organic cover: A promising approach to accelerate rehabilitation and generate value from sulfidic tailings?**  
Bryan Tisch, Suzanne Beauchemin, Sean Langley and Juha Metsaranta - Natural Resources Canada
- 11:15 - 1971 Reclaiming forests and wetlands on soft tailings in the Alberta Oil Sands: Syncrude Canada Ltd.'s Sandhill Fen Research Watershed**  
Lori Cyprien and Carla Wytrykush - Syncrude Canada Ltd.
- 11:30 - 1435 Characterizing vegetation and water impacts of oil sands tailing leaching**  
Nicholas Utting, Craig McMullen, Pamela Muñoz, Michelle Morin and Edith Li - Natural Resources Canada; Brad Pinno - University of Alberta
- 11:45 - 2194 CO<sub>2</sub> sequestration in a chrysotile mining waste pile**  
Georges Beaudoin, Ali Nowamooz, Christian Dupuis, John Molson, Jean-Michel Lemieux, Micha Horswill, Richard Fortier, Faiçal Larachi, Marc Constantin, Josée Duchesne and René Therrien - Université Laval



<b>MINERALS I</b>	<b>13:30 - 15:00</b>	<b>ROOM 109</b>
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**Combined Session.**

**MIN33: Mineral Exploration under Glaciated Cover: New Tools, Trends, and Discoveries II**

**Organizers:** Beth McClenaghan, Roger Paulen and Alain Plouffe, Geological Survey of Canada; Pertti Sarala, Geological Survey of Finland

**Chairs:** Roger Paulen; Alain Plouffe; Pertti Sarala

**MIN24: Stable and Radiogenic Isotope Systems: Applications in Exploration and the Environment II (AAG: 28th IAGS)**

**Organizers:** Shaun Barker, University of Waikato; Mathew Leybourne, Laurentian University; Peter Winterburn, University of British Columbia

**Chairs:** Shaun Barker; Mathew Leybourne

**13:30 - 1596 Using sulphide indicator mineral chemistry for ore discrimination and targeting in the Churchill Province, northern Quebec, Canada**

Charley Duran - Université du Québec à Chicoutimi; Hugo Dubé-Loubert - Ministère de l'Énergie et des Ressources Naturelles; Philippe Pagé - Université du Québec à Chicoutimi and IOS Services Géoscientifiques Inc.; Sarah-Jane Barnes - Université du Québec à Chicoutimi; Martin Roy - Université du Québec à Montréal; Dany Savard - Université du Québec à Chicoutimi

**13:45 - 2348 Advanced gold grains counting in glaciated terrain: The Goldcorp's Borden Gold case history**

Patrice Villeneuve and Réjean Girard - IOS Services Geoscientifiques Inc.

**14:00 - 1060 Advanced identification techniques for the indicator minerals in critical mineral exploration**

Pertti Sarala - Geological Survey of Finland and Oulu Mining School; Anne Taivalkoski and Irmeli Huovinen - Geological Survey of Finland; Heidi Kalliosalo and Jouko Karinen - Lapland University of Applied Sciences; Marja Lehtonen and Sari Lukkari - Geological Survey of Finland; Hanna Koskinen and Kari Strand - Oulu Mining School; Rauno Toppila and Jukka Joutsenvaara - Lapland University of Applied Sciences

**14:15 - 1957 Trace element geochemistry of Fe-(hydro)oxides from the unconformity-related U deposits in the Kiggavik camp (Nunavut, Canada)**

Sheida Makvandi and Georges Beaudoin - Université Laval; David Quirt and Patrick Ledru - Aрева Resources Canada; Mostafa Fayek - University of Manitoba

**14:30 - 1837 A novel sediment transport modelling and multivariate approach to interpreting regional till survey geochemical anomalies in central British Columbia, Canada**

Dave Sacco - Palmer Environmental Consulting Group; Ray E. Lett - Geochemist; Wayne Jackaman - Noble Exploration Services

<b>MINERALS II</b>	<b>13:30 - 15:00</b>	<b>ROOM 110</b>
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**MIN29: Exploration Undercover - Techniques, Technology and Strategy III (AAG: 28th IAGS)**

**Organizers:** Ryan Noble, CSIRO Mineral Resources; Peter Winterburn, University of British Columbia

**Chairs:** Matthew Bodnar, CSA Global; Erica Cayer, Klondyke Gold Corp.; Ryan Noble; Peter Winterburn

**13:30 - 2415 Hunting for REE minerals in northern Labrador: MLA-SEM analysis of surficial sediments down-ice from the Strange Lake deposit**

Derek Wilton and Mikayla Miller - Memorial University of Newfoundland


**THURSDAY, JUNE 21**

- 13:45 - 1227 Upscaling deep buried geochemical exploration techniques into European business – UpDeep**  
Maarit S. Middleton and Vesa Nykänen - Geological Survey of Finland; Jeremie Melleton and Bruno Lemiere - French Geological Survey; Pertti Sarala - Geological Survey of Finland; Peter Filzmoser - Vienna University of Technology; Paula Järvinen - Technical Research Centre of Finland Ltd., VTT; Maria Rinkkala - Spinverse Innovation Management Ltd.; Jens Rönqvist - Ab Scandinavian GeoPool Oy; Simon Thaarup - Geological Survey of Denmark and Greenland
- 
- 14:00 - 1495 A plan for resourcing future exploration**  
Adele Seymon - AMIRA International; Robbie Rowe - NextGen Geological; Joe Cucuzza - AMIRA International
- 
- 14:15 - 1676 Geochemical challenges and discoveries of exploration undercover in China**  
Xueqiu Wang and Bimin Zhang Chinese Academy of Geological Sciences; Deping Yang - Shandong Academy of Geological Science; Ruihong Li and Mi Tian - Chinese Academy of Geological Sciences
- 
- 14:30 - 1131 Drift prospecting in glaciated, thick overburden regions: A case study in the Ring of Fire area of Hudson Bay lowlands, Ontario, Canada**  
Cunhai Gao and Dave Crabtree - Ontario Geological Survey; John Menzies - Brock University; Sandra Clarke - Ontario Geological Survey

**MINERALS III**
**13:30 - 15:00**
**ROOM 111**

- MIN34: Mining for Clean Energy - the Role of Minerals and Metals in the Clean Energy Transition**  
**Organizer:** Dan Woynilowicz, Clean Energy Canada  
**Chair:** Ben McLellan, Kyoto University
- 
- 13:30 - 1682 KEYNOTE: Minerals-Energy Nexus and the Future of Low-Carbon Technologies**  
Benjamin C. McLellan - Kyoto University; Eiji Yamasue - Ritsumeikan University
- 
- 14:00 - 2230 Material requirements for the energy transition**  
Rene Kleijn and Ester van der Voet - Leiden University
- 
- 14:15 - 1922 Creating Conflict-Resilient Mineral Supply Chains in an Era of Low-Carbon Technology**  
Joanne Lebert - IMPACT
- 
- 14:30 - 2201 Lithium exploitation policies in the Transition to electric mobility**  
Marie Forget - Université Savoie Mont-Blanc
- 
- 14:45 - 1411 A geo-economic outlook for lithium-ion battery raw materials needed by the automotive industry**  
Lucas Philipp Weimer, Tobias Braun, Simon Weimer and Bernd Lottermoser - Institute of Mineral Resources Engineering

**MINERALS IV**
**13:30 - 15:00**
**ROOM 114**

- MIN58: Geometallurgy III**  
**Organizers:** Andrew Bamber, Bara Consulting; John Barr, AngloAmerican; Sandra Birtel, Helmholtz-Zentrum Dresden-Rossendorf (HZDR); Thomas Chudy, University of British Columbia (UBC); Hugh de Souza, SGS Canada; Jens Gutzmer, HZDR; Julie Hunt, Bern Klein, David Turner and Peter Winterburn, UBC  
**Chairs:** Hugh de Souza; Laura Tusa, HZDR

**THURSDAY, JUNE 21**

13:30 - 2000	<b>Applications of reflectance spectroscopy in sensor-based rock sorting</b> David Turner – University of British Columbia and MineSense Technologies; Andrew Bamber - Bara Consulting; Lee Groat - University of British Columbia; Benoit Rivard - University of Alberta; Thomas Chudy - University of British Columbia
13:45 - 1708	<b>A 3D geometrical and geometalurgical model of a chromite mine</b> Peter Menzel, Kai Bachmann, Angel Prior-Arche, Raimon Tolosana-Delgado, Karl Gerald van den Boogaart and Jens Gutzmer - Helmholtz Institute Freiberg for Resource Technology
14:00 - 1157	<b>REE by-product potential at Catalão I: A geometalurgical assessment</b> Sandra Birtel and Lucas Pereira - HZDR; Andre Carlos Silva - Federal University of Goiás; Jens Gutzmer - HZDR
14:15 - 2255	<b>Geometalurgical modelling of Mabounié Nb-REE deposit (Gabon)</b> Simon B. Blancher, Arthur Delaporte and Thomas Wallmach - ERAMET Research

<b>MINERALS V</b>	<b>13:30 - 15:00</b>	<b>ROOM 115</b>
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<b>MIN47:</b>	<b>Quantitative Assessment and Prediction of Deeply Buried Mineral Resources in Covered Regions</b>
<b>Organizer and Chair:</b>	Qiuming Cheng, International Union of Geological Sciences (IUGS)
13:30 - 1483	<b>A cost-effective way to evaluate mineral resources in covered prospects – a little known use of surficial geochemistry</b> Nadia Yavorskaya - NADia Geochemistry Services
13:45 - 2342	<b>Integrated methods for potential mapping for undiscovered mineral deposits in covered areas</b> Qiuming Cheng - International Union of Geological Sciences (IUGS)
14:00 - 2093	<b>Solving of complex and dimmed geochemical fingerprints of mineral deposits across thick overburden with the use of Hypercube</b> Réjean Girard and Clément Dombrowski - IOS Services Géoscientifiques Inc.
14:15 - 1476	<b>Joint Inversion of Seismic and Audio Magnetotelluric with Structural Constraint for Metallic Deposit Model</b> Enhedelihai Nilot, Xiaodan Li, Jianyu Zhao and Xuan Feng - Jilin University
14:30 - 1077	<b>Integrating boot leather, imagination and a supercomputer: Exploration for the Future new search spaces in undercover Australia</b> Richard Blewett - Geoscience Australia
14:45 - 1602	<b>Deep Mining Queensland: 3D evaluation of prospectivity and mining amenability in the Cloncurry Belt, Queensland, Australia</b> Richard Valenta, Mark Hinman and Travis Murphy - University of Queensland; John Donohue - Geodiscovery Group; Mark Pirlo - Consultant; Mark Jones - University of Queensland
15:00 - 1629	<b>Three-dimensional gravity forward modeling with topographic effect based on Delaunay refinement method</b> Zhuo Jia, Sixin Liu and Xuan Feng - Jilin University

<b>MINERALS VI</b>	<b>13:30 - 15:00</b>	<b>ROOM 116</b>
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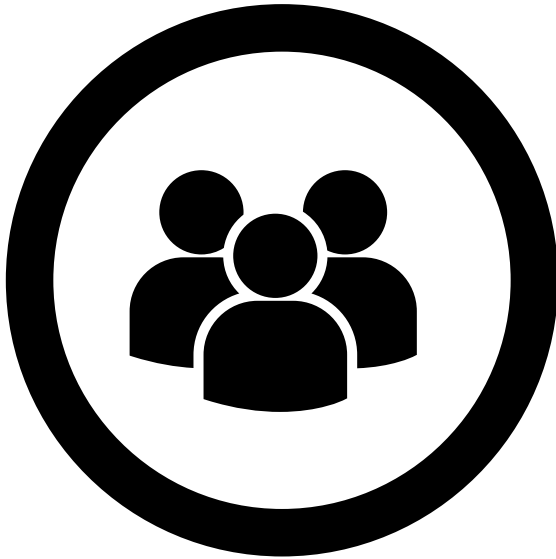
<b>MIN62:</b>	<b>Innovations in Tailings Management and Utilization III</b>
<b>Organizers:</b>	Greg Dipple, University of British Columbia (UBC); Ian Power, Trent University; Dirk Van Zyl, UBC
<b>Chairs:</b>	Greg Dipple; Ian Power


**THURSDAY, JUNE 21**

- 13:30 - 2035**    **Characterization of Ultramafic Mine Tailings Reactivity for Carbon Capture, Utilization, and Storage**  
Xueya Lu and Gregory Dipple - University of British Columbia
- 
- 13:45 - 2319**    **CO<sub>2</sub> availability controls whether hydrotalcites or hydrated Mg-carbonates act as carbon sinks in serpentinite mineral wastes from the Woodsreef Chrysotile Mine, NSW, Australia**  
Connor Turvey - Monash University; Siobhan Wilson - University of Alberta; Jessica Hamilton - University of Queensland; Alastair Tait - Monash University; Jenine McCutcheon - University of Leeds; Andreas Beinlich - Curtin University; Stewart Fallon - Australian National University; Gregory Dipple - University of British Columbia; Gordon Southam - University of Queensland
- 
- 14:00 - 1471**    **Strategizing a carbon neutral mine at the Baptiste deposit in Decar nickel district, British Columbia, Canada through direct air capture**  
Ian M. Power - Trent University
- 
- 14:15 - 1432**    **Stabilizing mine waste and reducing greenhouse gas emissions by targeting labile magnesium in tailings for accelerated carbon mineralization**  
Sterling Vanderzee; Greg Dipple - University of British Columbia; Ian Power - Trent University; Peter Bradshaw - FPX Nickel Corp.

**MINERALS VII**
**13:30 - 15:00**
**ROOM 117**

- MIN24:**    **Stable and Radiogenic Isotope Systems: Applications in Exploration and the Environment III (AAG: 28th IAGS)**
- Organizers:**    Shaun Barker, University of Waikato; Mathew Leybourne, Laurentian University; Peter Winterburn, University of British Columbia
- Chairs:**    Shaun Barker; Mathew Leybourne
- 
- 13:30 - 2327**    **Can Zn isotopes be used for surface geochemical exploration?**  
Sam Spinks and Yulia Uvarova - Commonwealth Scientific and Industrial Research Organisation (CSIRO) Mineral Resources
- 
- 13:45 - 1204**    **Biogeochemical exploration for Zn-Pb systems: a new trial of Zn isotopes**  
Nathan Reid, Samuel Spinks and Robert Thorne - Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- 
- 14:00 - 1981**    **Isotopic Analysis of Porewater Sulfate in an Ordovician aquiclude of the Michigan Basin**  
Jing Zhang, Ian Clark and Josué Jautzy - University of Ottawa
- 
- 14:15 - 2436**    **Constraining heatflow in hydrothermal systems using carbonate clumped isotopes: results from the Taupo Volcanic Zone and the Waihi Epithermal Au-Ag Deposit?**  
John Mering and Shaun Barker - University of Waikato



TECHNICAL PROGRAM

# RESOURCES & SOCIETY

## RESOURCES AND SOCIETY I

10:30 - 12:00

ROOM 118

**RS31: Resources and Sustainability: Dialogue, Design, and Developing Differently I**  
**Organizers:** Bruce McKenney, The Nature Conservancy  
**Chairs:** Margaret Armstrong, Fundação Getulio Vargas, Escola de Matemática Aplicada, Brazil; Normand Champigny, Sphinx Resources Ltd.; Bruce McKenney; Wendy Tyrrell, Development Partner Institute

**10:30 - 2382 Designing Sustainable Prosperity**  
 Doris Hiam-Galvez, John Hiam and George Davies - Hatch

**10:45 - 2192 Mineral resources in sustainable land-use planning: MINLAND Project**  
 Ronald Arvidsson and Nikolaos Arvanitidis - Swedish Geological Survey; Slavko Solar and Jelena Vidovic - EuroGeoSurveys

**11:00 - 1720 Green Mining: Is it a myth?**  
 Jennifer Broadhurst - University of Cape Town

**11:15 - 1257 The world mining map of the future: from ores to geopolitics**  
 Michel Jébrak - Université du Québec à Montréal

*11:30 Panel Discussion*

## RESOURCES AND SOCIETY III

10:30 - 12:00

ROOM 120

**RS24: Global-Scale Geochemical Mapping: A Critical Component for Resourcing Future Generations I**  
**Organizers:** Patrice de Caritat, Geoscience Australia; Alecos Demetriades, International Union of Geological Sciences (IUGS) Commission on Global Geochemical Baselines; David Smith, U.S. Geological Survey; Xueqiu Wang, Chinese Academy of Geological Sciences  
**Chairs:** Alecos Demetriades; Sibongiseni Musa Hlatshwayo, Council for Geoscience, South Africa

**10:30 - 1453 KEYNOTE: Global-scale geochemical data in the exploration for and development of mineral resources for future generations**  
 David B. Smith - U.S. Geological Survey; Alecos Demetriades - International Union of Geological Sciences (IUGS) Commission on Global Geochemical Baselines; Patrice de Caritat - Geoscience Australia; Xueqiu Wang - UNESCO International Centre on Global-Scale Geochemistry

**11:00 - 1625 Mapping the Chemical Earth: a multi-scale geochemical data for resourcing future generations**  
 Xueqiu Wang, Jian Zhou, Bimin Zhang, Lanshi Nie, Shanfa Xu, Wei Wang, Hanliang Liu, Dongsheng Liu, Qingqing Liu and Mi Tian - Chinese Academy of Geological Sciences

**11:15 - 1417 Geochemical mapping of Europe for the delineation of metallogenic provinces, and establishment of baselines for environmental management**  
 Alecos Demetriades - International Union of Geological Sciences (IUGS) Commission on Global Geochemical Baselines; Timo Tarvainen - Geological Survey of Finland; Clemens Reimann - Geological Survey of Norway; Manfred Birke - Bundesanstalt für Geowissenschaften und Rohstoffe; Philippe Négrel - French Geological Survey; Anna Ladenberger - Geological Survey of Sweden

**11:30 - 1802 Low-density geochemical mapping at continental scale reveals background for emerging tech-critical elements**  
 Philippe Négrel - French Geological Survey; Anna Ladenberger - Geological Survey of Sweden; Clemens Reimann - Geological Survey of Norway; Manfred Birke - Bundesanstalt für Geowissenschaften und Rohstoffe; Alecos Demetriades - Institute of Geology and Mineral Exploration; Martiya Sadeghi - Geological Survey of Sweden



**11:45 - 1628 The GEMAS Strontium Isotope Map of Europe with forensic provenancing applications**  
 Jurian Hoogewerff - University of Canberra; Clemens Reiman - Geological Survey of Norway; Henriette Ueckerman - University of Johannesburg; Robert Frei - University of Copenhagen; Karin Frei - The National Museum of Denmark; Thalita van Aswegen, Claudine Stirling and Malcolm Reid - University of Otago; GEMAS Project Team - EuroGeoSurveys

**RESOURCES AND SOCIETY IV 10:30 - 12:00 ROOM 121**

**RS26: Future Role of Geological Mapping and Three-Dimensional Geological Modelling for Sustainable Resource Development I**  
**Organizers:** Holger Kessler, British Geological Survey; Kelsey MacCormack, Alberta Geological Survey; Mark Rattenbury, GNS Science; Hazen Russell, Geological Survey of Canada; Jeroen Schokker, Geological Survey of the Netherlands  
**Chairs:** Holger Kessler; Kelsey MacCormack; Hazen Russell; Jeroen Schokker; Harvey Thorleifson, Minnesota Geological Survey

**10:30 - 1027 KEYNOTE: The role of geological mapping in our nations**  
 Harvey Thorleifson - Minnesota Geological Survey

**11:00 - 2358 The U.S. National Geologic Map Database -- Resources and support for geologic mapping of the Nation**  
 David R. Soller - U.S. Geological Survey

**11:15 - 1452 Update on activities and future plans for the Geological Survey of Canada's Geomapping for Energy and Minerals Program**  
 Carl Ozyer - Geological Survey of Canada

**11:30 - 2046 British Columbia Geological Survey mapping: From the field to the web**  
 Adrian Scott Hickin - BC Geological Survey

**RESOURCES AND SOCIETY I 13:30 - 15:00 ROOM 118**

**RS31: Resources and Sustainability: Dialogue, Design, and Developing Differently II**  
**Organizer:** Bruce McKenney, The Nature Conservancy  
**Chairs:** Margaret Armstrong, Fundação Getulio Vargas, Escola de Matemática Aplicada, Brazil; Normand Champigny, Sphinx Resources Ltd.; Bruce McKenney; Wendy Tyrrell, Development Partner Institute

**13:30 - 1189 Social Licence to Finance & its Impact on the Coal Mining Industry**  
 Margaret Armstrong - Fundação Getulio Vargas, Escola de Matemática Aplicada, Brazil

**13:45 - 2177 A quarry design process for achieving economic, safe and environmentally/socially acceptable extraction of aggregates and other construction materials**  
 Ruth Allington - GWP Consultants LLP, Pan European Reserves and Resources Reporting Committee, Task Group on Global Geoscience Professionalism

**14:00 - 1927 Canada's Mineral Resource Production, Past, Present and Future: Challenges to Sustainability**  
 Tom Lane - Canadian Mining Industry Research Organization (CAMIRO), self-employed

**14:15 - 1309 CANADA'S NEXT EDGE: Why Clean Innovation is Critical to Canada's Economy and How We Get It Right**  
 William Scott and Stewart Elgie - University of Ottawa; Michelle Brownlee - formerly University of Ottawa



**RESOURCES AND SOCIETY III****13:30 - 15:00****ROOM 120**

**RS24: Global-Scale Geochemical Mapping: A Critical Component for Resourcing Future Generations II**

**Organizers:** Patrice de Caritat, Geoscience Australia; Alecos Demetriades, International Union of Geological Sciences (IUGS) Commission on Global Geochemical Baselines; David Smith, U.S. Geological Survey; Xueqiu Wang, Chinese Academy of Geological Sciences

**Chairs:** Alecos Demetriades; Sibongiseni Musa Hlatshwayo, Council for Geoscience, South Africa

**13:30 - 2349 Geochemical Atlas of Italian Agricultural and Grazing Land Soils (GEMAS)**  
Benedetto De Vivo - Pegaso University; Domenico Cicchella - Università degli Studi del Sannio; Albanese Stefano and Annamaria Lima - Università degli Studi di Napoli Federico II; Enrico Dinelli - Università Di Bologna; Paolo Valera - Università degli Studi di Cagliari; Daniella Zuzulo - Università degli Studi del Sannio; Attila Petrik - Università degli Studi di Napoli Federico II

**13:45 - 1249 Continental-scale mineral prospectivity assessment using the National Geochemical Survey of Australia (NGSA) dataset**  
Patrice de Caritat - Geoscience Australia; Matthew Cracknell - University of Tasmania; Eric Grunsky - University of Waterloo; Philip Main - Geoscience Australia; Alan Mann - Consultant

**14:00 - 1455 Arsenic distribution in soils of the conterminous United States—Results from continental-scale geochemical mapping**  
David B. Smith - U.S. Geological Survey

**14:15 - 1946 Regional geochemical mapping in Ontario: a one-time, multi-use, wide-spectrum characterization of ambient groundwater chemistry**  
Stewart Hamilton - Ontario Geological Survey

**14:30 - 1678 Distribution characteristics of Fluorine in drainage catchment sediment and alluvial soil of China**  
Qingqing Liu, Xueqiu Wang, Qinghua Chi and Ruihong Li - Chinese Academy of Geological Sciences

**14:45 - 1234 Geochemical Atlas of Colombia (AGC) Version 2017**  
Gloria Prieto - Geological Survey of Colombia; Adrian Perez - National University of Colombia; Olger Mendoza, Juan Fernando Jimenez, Omar Mendoza, Andrey Rincon, Fabio Castellanos and Claudia Orejuela - Geological Survey of Colombia

**RESOURCES AND SOCIETY IV****13:30 - 15:00****ROOM 121**

**RS26: Future Role of Geological Mapping and Three-Dimensional Geological Modelling for Sustainable Resource Development II**

**Organizers:** Holger Kessler, British Geological Survey; Kelsey MacCormack, Alberta Geological Survey; Mark Rattenbury, GNS Science; Hazen Russell, Geological Survey of Canada; Jeroen Schokker, Geological Survey of the Netherlands

**Chairs:** Holger Kessler; Kelsey MacCormack; Hazen Russell; Jeroen Schokker; Harvey Thorleifson, Minnesota Geological Survey

**13:30 - 1463 Geospatial Frame Data Model for Digital Geological Map Compilation and Integration**  
Yao Cui - BC Geological Survey

**13:45 - 1950 The long way from geological maps to a consistent multi-thematic WebMapService in Austria**  
Esther Hintersberger, Christoph Iglseder, Ralf Schuster, Viktoria Haider, Johannes Reischer and Hans-Georg Krenmayr - Geological Survey of Austria





- 14:00 - 1371 **From maps to models – What do our clients need?**  
Roland Baumberger and Möri Andreas - Swiss Geological Survey
- 14:15 - 1281 **Multi-dimensional Geological Models; Are We Actually Delivering Something That Our Stakeholders Want?**  
Kelsey MacCormack, Paulina Branscombe, Dean Rokosh and Andrew Beaton - Alberta Geological Survey/Alberta Energy Regulator
- 14:30 - 1078 **Down under Down Under: mapping the Australian plate in 4D**  
Richard Blewett - Geoscience Australia
- 14:45 - 1089 **Consistently mapping deep basement structures throughout Canada in 3D**  
David B. Snyder - Laurentian University  
Eric de Kemp, Ernst Schetselaar and Marc St-Onge - Geological Survey of Canada

**RESOURCES AND SOCIETY I 15:30 - 17:00 ROOM 118**

- RS39: **Exploration Activities Communication and Public Engagement in Populated Regions**  
Organizers: Vítor Correia, Isabel Fernandez and Marko Komac, European Federation of Geologists  
Chair: Ruth Allington, European Federation of Geologists and Task Group on Global Geoscience Professionalism
- 15:30 - 2224 **The reputation of mining and exploration from a European perspective**  
Virginia del Río - At Clave; Marko Komac - European Federation of Geologists; Javier Gómez - At Clave; Ludger Benighaus - Dialogik; Sari Kauppi - SYKE; Juha Kotilainen - University of Eastern Finland; Juan Requejo - At Clave
- 15:45 - 2269 **Enhanced Public Engagement - Will This Ever Change Public Attitudes About The Proposed Mineral Working Next Door?**  
John Frederick Cowley - Mineral & Resource Planning Associates Ltd.
- 16:00 - 2020 **Defining and protecting “mineral deposits of public importance”:  
why information is not sufficient**  
Vitor Ramos Correia - European Federation of Geologists; Guenter Tiess - Minpol; Eva Hartai - University of Miskolc; Balazs Bodo - La Palma Research Centre; Isabel Fernandez and Michael Neumann - European Federation of Geologists
- 16:15 - 1045 **INFACT - Innovative, non-invasive and fully acceptable exploration technologies**  
Marko Komac - European Federation of Geologists; Samantha Roffey; Helene Koepf - Helmholtz-Zentrum Dresden-Rossendorf; Vitor Ramos Correia and Isabel Fernández Fuentes - European Federation of Geologists

16:30 *Panel Discussion*

**RESOURCES AND SOCIETY III 15:30 - 17:00 ROOM 120**

- RS24: **Global-Scale Geochemical Mapping: A Critical Component for Resourcing Future Generations III**  
Organizers: Patrice de Caritat, Geoscience Australia; Alecos Demetriades, International Union of Geological Sciences (IUGS) Commission on Global Geochemical Baselines; David Smith, U.S. Geological Survey; Xueqiu Wang, Chinese Academy of Geological Sciences  
Chairs: Alecos Demetriades; Sibongiseni Musa Hlatshwayo, Council for Geoscience, South Africa
- 15:30 - 2163 **Increased efficiency of the regional-scale geochemical exploration using innovative techniques of the metallogenic prognosis (as exemplified by the Russia-Kazakhstan border territory)**  
Igor Spiridonov and Viktor Kilipko - IMGRE



15:45 - 2162 **Geochemical mapping of the Russia-China border area**  
Victor Kilipko and Igor Spiridonov - IMGRE

16:00 *Panel Discussion*

**RESOURCES AND SOCIETY IV** **15:30 - 17:00** **ROOM 121**

**RS26: Future Role of Geological Mapping and Three-Dimensional Geological Modelling for Sustainable Resource Development III**  
Organizers: Holger Kessler, British Geological Survey; Kelsey MacCormack, Alberta Geological Survey; Mark Rattenbury, GNS Science; Hazen Russell, Geological Survey of Canada; Jeroen Schokker, Geological Survey of the Netherlands  
Chairs: Holger Kessler; Kelsey MacCormack; Hazen Russell; Jeroen Schokker; Harvey Thorleifson, Minnesota Geological Survey

15:30 - 2042 **KEYNOTE: Systematic subsurface mapping in the Netherlands: its future secured by a new law, and its funding because of a positive business case**  
Michiel Jan van der Meulen - Geological Survey of the Netherlands

16:00 - 1685 **From Seamless Bedrock Mapping towards a National Geological 3D-framework of Finland**  
Jarmo Kohonen, Jouni Vuollo, Jouni Luukas and Raimo Lahtinen - Geological Survey of Finland

16:15 - 1236 **Canada-3D: Recent Progress on National Compilations of the Surface and Subsurface Geology of Canada**  
Boyan Brodaric, Hazen Russell, David Snyder and Marc St-Onge - Geological Survey of Canada

16:30 - 1639 **Advances in the Development of a 3-D Framework for the Surficial Geology of Canada**  
Hazen A.J. Russell - Geological Survey of Canada (GSC), Nigel Atkinson - Alberta Energy Andrew F. Bajc - Ontario Geological Survey; Boyan Brodaric - GSC; Greg Keller - Manitoba Geological Survey; Kei Lo - Saskatchewan Water Security Agency; Michel Parent, Matthew Pyne, Rod Smith and Brian J. Todd - GSC



**RESOURCES AND SOCIETY I** **08:30 - 10:00** **ROOM 118**

**RS3:** **Public Reporting on Natural Resources: A Key Geoscience Contribution to Future Generations I**

**Organizers:** Hendrik Falck, Northwest Territories Geological Survey

**Chairs:** Jim Gouveia, Rose & Associates LLP; Hendrik Falck

**08:30 - 1113** **Lessons learned from public disclosures in mineral exploration**  
Normand Champigny - Sphinx Resources Ltd.; Éric Lemieux - EBL Consultants Enr.

**08:45 - 1220** **The Role of Geoscientists as Qualified Professionals – Experiences from the Gold Mining Industry**  
David Eden - Kinross Gold Corporation

**09:00 - 2187** **EFG and the Competent Person across Europe - Differences in History, Education, Qualification and Competence**  
Michael Neumann and Olaf Klärner - European Federation of Geologists

**09:15 - 1489** **The use of Risk Assessment approaches to support Mineral Resource Estimation and Classification in line with CRIRSCO-based reporting standards**  
Edmund John Sides - Orebody Risks Limited

**09:30 - 2497** **KEYNOTE: Changes to Reporting of Mineral Project Information Since the Initiation of NI 43-101**  
Deborah McCombe - RPA Inc.; Greg Gosson - Wood PLC

**RESOURCES AND SOCIETY II** **08:30 - 10:00** **ROOM 119**

**RS13:** **Geoethics and Environmental and Social Responsibility: Doing the Right Thing to Develop Resources for Future Generations I (IAPG)**

**Organizers:** Peter Bobrowsky, Geological Survey of Canada; Jan Boon, FaciliTech International and Environment and Social Responsibility Society of the Canadian Institute of Mining;

**Chairs:** Giuseppe Di Capua and Silvia Peppoloni, Istituto Nazionale di Geofisica e Vulcanologia Ruth Allington, European Federation of Geologists and Task Group on Global Geoscience Professionalism; Peter Bobrowsky; Jan Boon; Giuseppe Di Capua; David Mogk, Montana State University; Silvia Peppoloni

**08:30 - 1983** **KEYNOTE: Responsible sourcing of minerals: putting values into the value chain**  
Nic Bilham - Geological Society of London; Frances Wall - University of Exeter

**09:00 - 2489** **KEYNOTE: The Ethical Responsibility of Mining to Contribute to Meeting the Sustainable Development Goals**  
Gavin M. Mudd - RMIT University

**09:30 - 1030** **KEYNOTE: Sociology for mineral exploration**  
Jan Boon - FaciliTech International

**RESOURCES AND SOCIETY IV** **08:30 - 10:00** **ROOM 121**

**RS26:** **Future Role of Geological Mapping and Three-Dimensional Geological Modelling for Sustainable Resource Development IV**

**Organizers:** Holger Kessler, British Geological Survey; Kelsey MacCormack, Alberta Geological Survey; Mark Rattenbury, GNS Science; Hazen Russell, Geological Survey of Canada; Jeroen Schokker, Geological Survey of the Netherlands

**Chairs:** Holger Kessler; Kelsey MacCormack; Hazen Russell; Jeroen Schokker; Harvey Thorleifson, Minnesota Geological Survey

- 08:30 - 1894** **3-D Geological mapping of sedimentary basins in Poland**  
Zbigniew Malolepszy and Ewa Szykaruk - Polish Geological Institute
- 08:45 - 1343** **Modelling 3.4 quadrillion m3 of geology: Integrating decades of knowledge and constructing the 3D Provincial Geological Framework Model of Alberta**  
Paulina Branscombe and Kelsey MacCormack - Alberta Geological Survey
- 09:00 - 2283** **Constructing a 3D resource model of the Dutch offshore sand reserves**  
Jelte Stam and Denise Maljers - Geological Survey of the Netherlands; Maaike Blauw, Marco De Kleine and Laura Vonhögen - Deltares; Ad Stolk - Rijkswaterstaat; Renée De Bruijn - Geological Survey of the Netherlands
- 09:15 - 1870** **What would we do without them? 3D geological voxel models for assessing resources and risks**  
Jan Stafleu, Denise Maljers, Jan Gunnink, Freek Busschers and Kay Koster - Geological Survey of the Netherlands; Vasileios Hademenos - Ghent University
- 09:30 - 1593** **Mapping offshore resources of the Belgian Continental Shelf using 3D voxel modelling**  
Vasileios Hademenos - Ugent; Tine Missiaen - Vlaams Instituut voor de Zee; Michel Kapel, Lars Kint and Nathan Terseleer - Royal Belgian Institute of Natural Sciences; Guy De Tré and Robin De Mol - Ghent University; Jan Stafleu, Peter-Paul van Maanen and Rick Appleton - Geological Survey of the Netherlands; Vera Van Lancker - Royal Belgian Institute of Natural Sciences
- 09:45 - 1433** **Improving Water and Environmental Regulation with the aid of 3D Geological Models**  
Holger Kessler and Catherine Cripps - British Geological Survey; Michael Kehinde - Environment Agency England; Andy Farrant - British Geological Survey

RESOURCES AND SOCIETY I	10:30 - 12:00	ROOM 118
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| <b>RS3:</b>         | <b>Public Reporting on Natural Resources: A Key Geoscience Contribution to Future Generations II</b>   |  |
| <b>Organizers:</b>  | Hendrik Falck, Northwest Territories Geological Survey   |  |
| <b>Chairs:</b>      | Jim Gouveia, Rose & Associates LLP; Hendrik Falck  |  |
| <b>10:30 - 1307</b> | <b>Public reporting on natural resources in New Brunswick, Canada; perspective from a smaller jurisdiction</b><br>Michael Alan Parkhill - New Brunswick Department of Energy & Resource Development; Bruce Broster - University of New Brunswick Fredericton; Steve McCutcheon - McCutcheon Geoconsulting; Paul Rennick and James Walker - New Brunswick Department of Energy & Resource Development |  |
| <b>10:45 - 1237</b> | <b>Reporting on Groundwater Information using International Data Standards for Integrated Resource Management</b><br>Boyan Brodaric - Geological Survey of Canada  |  |
| <b>11:00 - 1836</b> | <b>Groundwater Reporting and Management – An Example from Ontario, Canada</b><br>Steve Holysh, Rick Gerber, Mason Marchildon, Mike Doughty and Britt Smith - Oak Ridges Moraine Groundwater Program  |  |
| <b>11:15</b>        | <i>Panel Discussion: The panel will share their views on the current role and responsibilities of geoscientists with respect to public disclosures of sub-surface reserve and resources, and the role that they envision for geoscientists from their perspective as leaders of industry and governmental and regulatory agencies.</i>   |  |





**RESOURCES AND SOCIETY IV****10:30 - 12:00****ROOM 121**

- RS26: Future Role of Geological Mapping and Three-Dimensional Geological Modelling for Sustainable Resource Development V**  
**Organizers:** Holger Kessler, British Geological Survey; Kelsey MacCormack, Alberta Geological Survey; Mark Rattenbury, GNS Science; Hazen Russell, Geological Survey of Canada; Jeroen Schokker, Geological Survey of the Netherlands  
**Chairs:** Holger Kessler; Kelsey MacCormack; Hazen Russell; Jeroen Schokker; Harvey Thorleifson, Minnesota Geological Survey
- 10:30 - 1398 KEYNOTE: COST Sub-Urban. Examples and workflows for urban geological modelling and visualization from Europe**  
 Tim Kearsey - British Geological Survey; Jeroen Schokker - Geological Survey of the Netherlands; Peter Sandersen - Geological Survey of Denmark and Greenland; Hans de Beer - Geological Survey of Norway; Ingelöv Eriksson - Oslo City; Hillka Kallio - Geological Survey of Finland; Sebastian Pfeleiderer - Geological Survey of Austria; Anna Seither - Geological Survey of Norway; Ignace van Campenhout - University of Amsterdam; Diarmad Campbell - British Geological Survey
- 11:00 - 1675 The importance of integrated modeling for sustainable development of urban subsurface resources**  
 Jeroen Schokker - Geological Survey of the Netherlands; Carl Watson - British Geological Survey; Susie Mielby - Geological Survey of Denmark and Greenland
- 11:15 - 1165 Detailed geological modelling to support urban planning in Aarhus, Denmark**  
 Theis Raaschou Andersen and Søren Erbs Poulsen - VIA University College
- 11:30 - 1354 Rapid and Automatic Implicit 3D Regional Geological Modelling Based on HRBF and Boolean Extraction**  
 Jiateng Guo - Northeastern University; Chaoling Li - China Geological Survey; Lixin Wu - Central South University
- 11:45 - 1350 Building a Regional 3-D Geologic Model of the Paleozoic Bedrock of Southern Ontario**  
 Terry Carter - Carter Geoscience; Frank R. Brunton - Ontario Geological Survey; Jordan Clark - Ontario Oil, Gas, & Salt Resources Library; Lee Forner - Ontario Ministry of Natural Resources and Forestry; Charles Logan and Hazen A.J. Russell - Geological Survey of Canada; Maia Somers and Liz Sutherland - Ontario Oil, Gas, & Salt Resources Library; Kei Yeung - Ontario Geological Survey

**RESOURCES AND SOCIETY I****13:30 - 15:00****ROOM 118**

- RS27: International Cooperation in the Context of Geosciences Practice**  
**Organizers:** Vitor Correia, Isabel Fernandez and Marko Komac, European Federation of Geologists  
**Chair:** Bas De Leeuw, World Resources Forum and Coordinator of the H2020 FORAM Project
- 13:30 - 2329 Knowing Your Neighbours**  
 David Corriveau - Shell International E&P
- 13:45 - 1687 Sustainable Development Priorities in Eastern Africa: International Cooperation and the Role of Geoscience**  
 Joel C. Gill, Joseph Mankelow and Keely Mills - British Geological Survey
- 14:00 - 2005 Promoting dialogues and tracking drivers of change: the role of the International Raw Materials Observatory**  
 Vitor Ramos Correia - European Federation of Geologists; Steve Henley - Resources Computing International; Marko Komac - European Federation of Geologists; Balazs Bodo - La Palma Research Centre; Eva Hartai - University of Miskolc; Isabel Fernandez and Peter Mueller - European Federation of Geologists



**14:15 - 2270**    **The European Commission's Raw Materials Information System, the centre of EU knowledge base**  
 Tamas Hamor, Simone Manfredi, Constantin Ciupagea and David Pennington - Joint Research Centre, European Commission

**14:30 - 1531**    **The EU Horizon2020 INTERMIN Project - Building up an international network of training centers for raw material professionals**  
 Michael Neumann - European Federation of Geologists; Peter Mueller - Professional Association of German Geologists (BDG); Isabel Fernandez - European Federation of Geologists

**14:45 - 2011**    **FORAM: towards a World Forum of Raw Materials**  
 Vitor Ramos Correia - European Federation of Geologists; Mathias Schluep, Bas De Leeuw and Shahrzad Manoochehri - World Resources Forum; Marko Komac, Michael Neumann and Isabel Fernandez - European Federation of Geologists

**RESOURCES AND SOCIETY II**

**13:30 - 15:00**

**ROOM 119**

**RS13:**    **Geoethics and Environmental and Social Responsibility: Doing the Right Thing to Develop Resources for Future Generations III (IAPG)**

**Organizers:** Peter Bobrowsky, Geological Survey of Canada; Jan Boon, FaciliTech International and Environment and Social Responsibility Society of the Canadian Institute of Mining; Giuseppe Di Capua and Silvia Peppoloni, Istituto Nazionale di Geofisica e Vulcanologia

**Chairs:** Ruth Allington, European Federation of Geologists and Task Group on Global Geoscience Professionalism; Peter Bobrowsky, Jan Boon; Giuseppe Di Capua; David Mogk, Montana State University; Silvia Peppoloni

**13:30 - 2078**    **Lessons from the PDAC-AME Health and Safety Survey for the Professional Geoscientist**  
 William Mercer - Avalon Advanced Materials Inc.

**13:45 - 1300**    **The emerging niche for ethical small-scale mining**  
 Kathryn Ruth Moore - University of Exeter; Dylan McFarlane - Pact; Dana Finch - University of Exeter; Dominic Roberts - Mineco

**14:00 - 1182**    **Geoethics in mining: the White Paper on Responsible Mining**  
 Giuseppe Di Capua - Istituto Nazionale di Geofisica e Vulcanologia; Nikolaos Arvanitidis - Geological Survey of Sweden; Jan Boon - FaciliTech International; Pekka A. Nurmi - Geological Survey of Finland

**14:15 - 1073**    **Factors of Influence for the Awarding of the Social License to Operate in the Brazilian Mining Sector**  
 Ana Lúcia Frezzatti Santiago - FEI University; Demajorovic Jacques - Centro Universitário da FEI; Aledo Antonio - Universidad de Alicante

**14:30 - 1025**    **Geoethics for actors in wicked socio-environmental systems**  
 Martin Bohle - European Commission, Directorate-General for Research and Innovation

**14:45 - 1016**    **Transformation: From Fossil Fuels to the Future**  
 Edith Newton Wilson - Rock Whisperer LLC

**RESOURCES AND SOCIETY III**

**13:30 - 15:00**

**ROOM 120**

**RS34:**    **Exploration and Mining in the 21st Century: From Responsible to Sustainable I**  
 Organizers and Chairs: Sarah Caven, Minerals and Sustainability Consultant; Greg Wessel, Geology In The Public Interest

**13:30 - 1278**    **KEYNOTE: Mining as Sustainable Restoration: A New Approach to Resource Recovery**  
 Gregory Wessel - Geology In The Public Interest

- 14:00 - 1988 **Three Keys for a Sustainable Minerals Industry**  
Karin Olson Hoal
- 
- 14:15 - 2137 **Mineral exploration: a potential catalyst for improved social, economic and environmental outcomes?**  
Sarah Caven - Minerals and Sustainability Consultant
- 
- 14:30 - 1298 **What constitutes a meaningful shift from responsibility to sustainability in mineral exploration?**  
Susan Joyce - On Common Ground Consultants Inc.
- 
- 14:45 - 1449 **Fondo Santa Barbara: Globally Applying a Successful ASM Case History**  
Leigh W. Freeman and Rob Johansing - Fondo Santa Barbara

**RESOURCES AND SOCIETY IV 13:30 - 15:00 ROOM 121**

- RS26: Future Role of Geological Mapping and Three-Dimensional Geological Modelling for Sustainable Resource Development VI**
- Organizers:** Holger Kessler, British Geological Survey; Kelsey MacCormack, Alberta Geological Survey; Mark Rattenbury, GNS Science; Hazen Russell, Geological Survey of Canada; Jeroen Schokker, Geological Survey of the Netherlands
- Chairs:** Holger Kessler; Kelsey MacCormack; Hazen Russell; Jeroen Schokker; Harvey Thorleifson, Minnesota Geological Survey
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- 13:30 - 1052 **KEYNOTE: Loop - A new open source 3D geo-structural simulator**  
Laurent Ailleres and Lachlan Grose - Monash University; Gautier Laurent - Université de Lorraine; Robin Armit - Monash University; Mark Jessell - University of Western Australia; Guillaume Caumon - Université de Lorraine; Eric de Kemp - Geological Survey of Canada; Florian Wellmann - RWTH Aachen University; Mark Lindsay - University of Western Australia; Peter Betts and Alexander Cruden - Monash University
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- 14:00 - 1430 **Applications and improvements of digital ground modelling in support of the maintenance and upgrading of rail infrastructure**  
Holger Kessler and Ben Wood - British Geological Survey; Gerard McArdle and Calum Irving - TSP; Steve Thorpe - British Geological Survey
- 
- 14:15 - 1698 **Research on Three-Dimensional Geological Model Data Exchange Format**  
Gao Zhenji, Wu Zixing, Song Yue and Qu Honggang - China Geological Survey
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- 14:30 - 1422 **Evaluating Uncertainty in Geological Models**  
Alan Keith Turner - Colorado School of Mines and British Geological Survey; Marco Bianchi - British Geological Survey
- 
- 14:45 - 1126 **PRB 3D geological map modeling technology**  
Chaoling Li and Fengdang Li - China Geological Survey; Jiateng Guo - Northeastern University, Shengyang; Chang Liu and Yuanyuan Liu - China Geological Survey, Feixiang Chen - Beijing Forestry University





RS34: Organizers and Chairs:	<b>Exploration and Mining in the 21st Century: From Responsible to Sustainable II</b> Sarah Caven, Minerals and Sustainability Consultant; Greg Wessel, Geology In The Public Interest
15:30 - 1037	<b>Humanitarian Engineering: Achieving Sustainable Development through Socially Responsible Engineering in Mining</b> Jessica Smith and Juan Lucena - Colorado School of Mines
15:45 - 1301	<b>Sustainable, technology-driven, whole-system approaches to small-scale mining in the 21st Century</b> Kathryn Ruth Moore - University of Exeter
16:00 - 2495	<b>The automated mine site: Driving sustainability and safety with Automated Haulage Systems</b> Caley Clinton and Brian Yureskes - Komatsu
16:15 - 1661	<b>Complex Ore Bodies – integrating knowledge for developing mines of the future</b> Richard Valenta, Alice Clark, Glen Corder, Robin Evans, Deanna Kemp and Neville Plint - University of Queensland
16:30 - 1191	<b>Opportunities at the Sanford Underground Research Facility</b> Jaret Heise - Sanford Underground Research Facility
16:45 - 1739	<b>Mining, Ecological Engineering and Metals Extraction for the 21st Century</b> Margarete Maria Kalin - Boojum Research Limited; Michael P. Sudbury - Michael P. Sudbury Consulting Services Inc.; Bryn Harris - NMR360 Inc.; William Wheeler - Boojum Research Limited



**RESOURCES AND SOCIETY I** **08:30 - 10:00** **ROOM 118**

**RS17:** **Geoscience Information Technology for the Next Generation I**  
**Organizers:** Zhang Minghua, China Geological Survey  
**Chairs:** Kombada Mhopjeni, Geological Survey of Namibia; Zhang Minghua; Oliver Raymond, Geoscience Australia; François Robida, French Geological Survey

**08:30 - 2274** **KEYNOTE: Development of standards: a key mission for geological surveys in their new role**  
 François Robida – French Geological Survey

**09:00 - 1713** **KEYNOTE: GeoSciML: An international standard for geological sciences**  
 Eric Boisvert - Natural Resources Canada; James Passmore - British Geological Survey

**09:30 - 1186** **A new tool for Chinese geological data transfer based on GeoSciML4.1**  
 Yongzhi Wang; Minghua Zhang and Rongmei Liu - China Geological Survey

**RESOURCES AND SOCIETY II** **08:30 - 10:00** **ROOM 119**

**RS8:** **Geoethics and Responsible Conduct of Scientists (IAPG)**  
**Organizers:** Susan Kieffer, University of Illinois at Urbana-Champaign; David Mogk, Montana State University; Cindy Palinkas, University of Maryland Center for Environmental Science  
**Chairs:** Susan Kieffer; Cindy Palinkas

**08:30 - 1900** **KEYNOTE: Geoethics and Professionalism: The Responsible Conduct of Scientists**  
 David W. Mogk - Montana State University

**09:00 - 2279** **Promoting and regulating the responsible conduct of geoscientists – the role of codes and standards**  
 Ruth Allington - GWP Consultants LLP, Pan European Reserves and Resources Reporting Committee, Task Group on Global Geoscience Professionalism; Ed Swindell - Geological Society of South Africa; Oliver Bonham - Geoscientists Canada

**09:15 - 1311** **Ethics, Conduct and Practice – a short discussion**  
 Oliver J. Bonham - Geoscientists Canada

**09:30 - 2195** **Best practices for the use of location-based data in crisis situations**  
 Jonathan Drake and Jessica Wyndham – American Association for the Advancement of Science

**09:45 - 1966** **Situating geoscience from the inside and out: geoethical contributions from the discipline of Geography**  
 Marc Tadaki, David Reid, Leonora King and Lucy MacKenzie - University of British Columbia

**RESOURCES AND SOCIETY III** **08:30 - 10:00** **ROOM 120**

**RS34:** **Exploration and Mining in the 21st Century: From Responsible to Sustainable III**  
**Organizers and Chairs:** Sarah Caven, Minerals and Sustainability Consultant; Greg Wessel, Geology In The Public Interest

**08:30 - 2437** **Bioleaching of Municipal Solid Waste Incineration residues by S- and Fe-oxidizing bacteria**  
 Valerio Funari, Helena Gomes, Martina Cappelletti, Stefano Fedi, Enrico Dinelli, Mikw Rogerson and Will Mayes – University of Bologna  
 Marzia Rovere – National Research Council Institute of Marine Sciences



- 08:45 - 2074 **Sustainable Siphoning of Natural Resources from Biogeochemical Cycles across Highly Distributed Networks**  
Robert Greene and Scott Dunbar - University of British Columbia
- 09:00 - 2402 **Humboldt Mill: From Tarnished Brownfield to World Class Redevelopment**  
Jennifer Nutini - Eagle Mine, LLC
- 09:15 - 1673 **Transparency, materiality and competence in Resources and Reserves Reporting: Role of competent persons in sustainable development of mineral deposits**  
Abani Ranjan Samal - GeoGlobal LLC
- 09:30 - 2009 **Moving away from technical myopia to embracing non-technical factors in decisions: lessons from academia and practice**  
Livia Mello and Nadja Kunz - University of British Columbia

**RESOURCES AND SOCIETY IV 08:30 - 10:00 ROOM 121**

- RS22: **The Changing Role of Geological Surveys I**  
Organizers: Christian Bohm, Manitoba Geological Survey; Philip Hill, Geological Survey of Canada (GSC); Murray Hitzman, Irish Centre for Research in Applied Geosciences; Daniel Lebel, GSC; Harvey Thorleifson, Minnesota Geological Survey  
Chairs: Philip Hill; Murray Hitzman; Daniel Lebel; Harvey Thorleifson

- 08:30 - 1409 **KEYNOTE: Looking back at a decade of large and innovative geological survey programs in Canada, 2008-2018**  
Daniel Lebel - Geological Survey of Canada

- 09:00 - 2314 **KEYNOTE: The Fundamental and Pioneering Role of Geological Survey in China's Social Development**  
GUangsheng Yan - China Geological Survey

- 09:30 - 1134 **KEYNOTE: Where is geoscience research going and what are the roles of national geological surveys?**  
John Ludden - British Geological Survey

**RESOURCES AND SOCIETY I 10:30 - 12:00 ROOM 118**

- RS17: **Geoscience Information Technology for the Next Generation II**  
Organizers: Zhang Minghua, China Geological Survey  
Chairs: Kombada Mhopjeni, Geological Survey of Namibia; Zhang Minghua; Oliver Raymond, Geoscience Australia; François Robida, French Geological Survey

- 10:30 - 1511 **The Australian Geoscience Information Network (AusGIN) – Data delivery and analysis using international data standards and web services**  
Ollie Raymond and Michael Sexton - Geoscience Australia

- 10:45 - 2377 **The Precious Mosaic of Seafloor Data: Challenges, Chances and the EMODnet-Project**  
Kristine Charlotte Asch - Federal Institute for Geosciences and Natural Resources (BGR)

- 11:00 - 1849 **The potential of integrating public geo-information and oil & gas geophysical data for near-surface modelling - a case study from Central Europe, Poland**  
Jolanta Pilch and Adam Cygal - AGH University of Science and Technology

- 11:15 - 2380 **The Giobiodiveristy Database: The International Archive for Stratigraphic Information**  
Stanley C. Finney - International Union of Geological Sciences; Junxuan Fan - Nanjing Institute of Geology and Palaeontology

- 11:30 - 2161 **Geohazard Data Management for Improving Pipeline Safety**  
Michael Porter, Sarah Newton, Gerry Ferris and Patrick Grover - BGC Engineering Inc.

## RESOURCES AND SOCIETY II

10:30 - 12:00

ROOM 119

- RS9:** **Geoethics in Georisks Management for a Safer and More Resilient Society (IAPG)**  
**Organizers:** Peter Bobrowsky, Geological Survey of Canada; Vincent Cronin, Baylor University; Giuseppe Di Capua, Istituto Nazionale di Geofisica e Vulcanologia; Stefano Tinti, University of Bologna
- Chairs:** Vincent Cronin; Giuseppe Di Capua
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- 10:30 - 1810** **Considering hazards both inside and outside the property lines**  
 Vincent S. Cronin, Baylor University
- 
- 10:45 - 2417** **Advances in Geoethical Practice: the role of standards in geohazard studies**  
 Peter Bobrowsky - Geological Survey of Canada (GSC); Silvia Peppoloni and Giuseppe Di Capua - International Association for Promoting Geoethics (IAPG); David Huntley - GSC
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- 11:00 - 1013** **KEYNOTE: Geoethical consensus building through independent risk assessments**  
 Cesar Henri Oboni and Franco Oboni - Oboni Riskope Associates Inc.
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- 11:30 - 1312** **Oklahoma Earthquakes: Reviewing Almost A Decade of Induced Seismicity**  
 Edith Newton Wilson - Rock Whisperer LLC

## RESOURCES AND SOCIETY III

10:30 - 12:00

ROOM 120

- RS38:** **Balancing the Needs of Society with Natural Resources Development, Environmental Stewardship, and Community Well-Being I**  
**Organizer and Chair:** Stephen Morison, Geological Association of Canada
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- 10:30 - 2488** **EIA, Regulatory Capture, Communities and the Environment: The Case of Mt Thorley-Warkworth and Resource Governance in Australia**  
 Gavin M. Mudd - RMIT University
- 
- 10:45 - 2213** **Land use change due to mining: Mapping as a tool for resource governance**  
 Tim Tyson Werner and Gavin Mudd - RMIT University; Simon Jowitt - University of Nevada, Las Vegas; Stephen Northey - Monash University
- 
- 11:00 - 2028** **Rebranding commodities: the importance of making complexity visible**  
 Vitor Ramos Correia - European Federation of Geologists; Ruth Allington - GWP Consultants LLP; Michael Neumann, Marko Komac and Isabel Fernandez - European Federation of Geologists
- 
- 11:15 - 1223** **The exploitation of lignite in Germany, or how to make acceptable a devastating and contested activity?**  
 Michel Deshaies - Université de Lorraine
- 
- 11:30 - 1090** **Best Practices for Mine Reclamation Financial Security & Sustainability**  
 Allan Edward Ingelson - University of Calgary
- 
- 11:45 - 1750** **Closed Loop Diamond Drilling**  
 Alexander Christie - Hy-Tech Drilling Ltd.

## RESOURCES AND SOCIETY IV

10:30 - 12:00

ROOM 121

- RS22:** **The Changing Role of Geological Surveys II**  
**Organizers:** Christian Bohm, Manitoba Geological Survey; Philip Hill, Geological Survey of Canada (GSC); Murray Hitzman, Irish Centre for Research in Applied Geosciences; Daniel Lebel, GSC; Harvey Thorleifson, Minnesota Geological Survey
- Chairs:** Philip Hill; Murray Hitzman; Daniel Lebel; Harvey Thorleifson



- 10:30 - 2296 **The Modern Geological Survey: A Model for Research, Innovation, Synthesis and Analysis**  
Suzette M. Kimball and Victor Labson – U.S. Geological Survey
- 10:45 - 1190 **Challenges for geological surveys deriving from global megatrends – German BGR’s perspective and answers**  
Ralph Martin Watzel - Federal Institute for Geosciences and Natural Resources (BGR)
- 11:00 - 1640 **Main goals of the Geological Survey of Japan**  
Masahiko Makino - Geological Survey of Japan
- 11:15 - 1555 **Geological Survey of Finland (GTK) strengthening its role as a key player in the raw materials innovation ecosystem**  
Pekka Nurmi - Geological Survey of Finland
- 11:30 - 1217 **Geology for Society in Year 2058 - Some down to Earth perspectives**  
Morten Smelror - Geological Survey of Norway
- 11:45 - 2216 **Geological Surveys Down Under: The changing role of Geoscience Australia**  
James Johnson - Geoscience Australia

**RESOURCES AND SOCIETY I 13:30 - 15:00 ROOM 118**

- RS17: **Geoscience Information Technology for the Next Generation III**  
Organizers: Zhang Minghua, China Geological Survey  
Chairs: Kombada Mhopjeni, Geological Survey of Namibia; Zhang Minghua; Oliver Raymond, Geoscience Australia; François Robida, French Geological Survey

- 13:30 - 1662 **New Digital Era for Earth Sciences at Geoscience Australia**  
Carina Kemp, Matilda Thomas and David Lescinsky - Geoscience Australia

- 13:45 - 1112 **Geosciences data sharing with Geo-Cloud for new generation of geological survey**  
Minghua Zhang, Rongmei Liu and Jinli Miao - China Geological Survey; Mengliang Yu - China Institute of Geo-environment Monitoring

- 14:00 - 1015 **Next generation data delivery for NSW geoscientific data**  
Trisha Moriarty - Geological Survey of New South Wales

**RESOURCES AND SOCIETY II 13:30 - 15:00 ROOM 119**

- RS10: **Geoethics in Geoscience Education, Communication, and Citizen Science: Experiences, Approaches, and Concepts I (IAPG)**  
Organizers and Chairs: Nic Bilham, Geological Society of London; Martin Bohle, European Commission, Directorate General – Research and Innovation; Silvia Peppoloni, Istituto Nazionale di Geofisica e Vulcanologia; Iain Stewart, University of Plymouth

- 13:30 - 1294 **KEYNOTE: Framing geoethics: definitions, methods, tools**  
Silvia Peppoloni - Istituto Nazionale di Geofisica e Vulcanologia

- 14:00 - 1039 **Geoethics Proper and geo-Humanities**  
Martin Bohle - European Commission, Directorate-General for Research and Innovation; Nic Bilham - The Geological Society; Giuseppe Di Capua and Silvia Peppoloni - Istituto Nazionale di Geofisica e Vulcanologia; Eduardo Marone - Paraná Federal University Foundation, Federal University of Paraná

- 14:15 - 2320 **Geosciences in a religious setting? History of geosciences as tool for interdisciplinary dialogue and geoethics**  
Martina Kölbl-Ebert - Jura-Museum Eichstätt



14:30 - 1699 **Geology for Global Development – Mobilising and Reshaping the Geology Community to Help Deliver the UN Sustainable Development Goals**  
Joel C. Gill - British Geological Survey

14:45 - 2236 **Broadening an international focus on access and inclusion: The new IAGD Chapter in the UK**  
Jacqueline Houghton - University of Leeds; Alison Stokes - University of Plymouth;  
Christopher Atchison - University of Cincinnati

**RESOURCES AND SOCIETY III 13:30 - 15:00 ROOM 120**

RS38: **Balancing the Needs of Society with Natural Resources Development, Environmental Stewardship, and Community Well-Being II**  
Organizer and Chair: Stephen Morison, Geological Association of Canada

13:30 - 1328 **Material Resource Demand and the Sustainable Development Goals**  
Thomas Graedel - Yale University

13:45 - 1195 **From Conflict to Collaboration: Building Mining-Community Partnerships to Advance the UN Sustainable Development Goals**  
Jocelyn Fraser - University of British Columbia

14:00 - 1160 **Can large resource developments contribute to sustainable development in northwest B.C.?**  
Debra Stokes - TBL Consultants Ltd.; Marcello Veiga and Bruce Marshall - University of British Columbia

14:15 *Panel Discussion*

**RESOURCES AND SOCIETY IV 13:30 - 15:00 ROOM 121**

RS22: **The Changing Role of Geological Surveys III**  
Organizers: Christian Bohm, Manitoba Geological Survey; Philip Hill, Geological Survey of Canada (GSC); Murray Hitzman, Irish Centre for Research in Applied Geosciences; Daniel Lebel, GSC; Harvey Thorleifson, Minnesota Geological Survey  
Chairs: Philip Hill; Murray Hitzman; Daniel Lebel; Harvey Thorleifson

13:30 - 1792 **RFG: Relevant and Flexible Geosurveys? How Geological Survey Ireland is adapting**  
Koen Verbruggen, Monica Lee and Ray Scanlon - Geological Survey Ireland

13:45 - 2411 **Changing Roles of State Geological Surveys in the United States: Experiences from Illinois**  
Andrew Stumpf, Richard Berg, Brandon Curry and Jason Thomason - Illinois State Geological Survey, University of Illinois Urbana-Champaign

14:00 - 1805 **The Evolution of the Saskatchewan Geological Survey**  
Gary Delaney, Jason Berenyi, Melinda Yurkowski and Ryan Morelli - Saskatchewan Geological Survey

14:15 - 2521 **The Ontario Geological Survey's Groundwater Initiative: Geoscience mapping in support of groundwater management**  
Elizabeth Priebe, Andy F. Bajc, Frank R. Brunton, Abigail K. Burt, Kayla Dell, Stew M. Hamilton and Riley P.M. Mulligan - Ontario Geological Survey

14:15 - 1128 **EarthResourceML and Lite - the CGI-IUGS Data Standards to Deliver Mineral Resource Data Globally**  
Jouni Vuollo - Geological Survey of Finland; Daniel Cassard - French Geological Survey; Oliver Raymond and Michael Sexton - Geoscience Australia; Mark Rattenbury - GNS Science; James Passmore - British Geological Survey



14:30 - 1384 **How to build up Mineral Resource database and data sharing service applying ERM data model and CGI terminology, case GTK**  
 Jouni Vuollo, Taina Eloranta, Niina Ahtonen and Juha Strengell - Geological Survey of Finland

14:45 - 1718 **Global mineral resource data – how to deliver data using the OneGeology platform**  
 James Passmore - British Geological Survey; Jouni Vuollo - Geological Survey of Finland; Ollie Raymond - GeoScience Australia; Mark Rattenbury - GNS Science

**RESOURCES AND SOCIETY I 15:30 - 17:00 ROOM 118**

RS17: **Geoscience Information Technology for the Next Generation IV**  
**Organizer:** Zhang Minghua, China Geological Survey  
**Chairs:** Kombada Mhopeni, Geological Survey of Namibia; Zhang Minghua; Oliver Raymond, Geoscience Australia; François Robida, French Geological Survey

15:30 - 1068 **The benefits of applying international geoscience terminology and data model standards to New Zealand's earth resource datasets**  
 Mark Rattenbury - GNS Science

15:45 - 1139 **Publishing mineral resources web services for Geoscience Australia**  
 Michael Graham Sexton - Geoscience Australia

16:00 - 1790 **Mineral deposits valorisation of as one of the most important information about the mineral potential in Poland and conditions for its use now and in the future**  
 Barbara Radwanek-Bak - Polish Geological Institute, National Research Institute

16:15 - 2378 **3D Geological Models Interoperability**  
 Christelle Loiselet and François Robida - French Geological Survey

16:30 - 2312 **An MPS-based Algorithm for Simulating of 3D Geological Structure with 2D Cross-sections**  
 Weisheng Hou, Tiancheng Zheng and Hengguang Liu - Sun Yat-sen University

16:45 - 1651 **3D Visualization Platform Based on the Integration of Ground- and Underground Geological information**  
 Yue Song, Zhenji Gao, Jia Liu, Honggang Qu and Zixing Wu - China Geological Survey

**RESOURCES AND SOCIETY II 15:30 - 17:00 ROOM 119**

RS10: **Geoethics in Geoscience Education, Communication, and Citizen Science: Experiences, Approaches, and Concepts II (IAPG)**  
**Organizers and Chairs:** Nic Bilham, Geological Society of London; Martin Bohle, European Commission, Directorate General – Research and Innovation; Silvia Peppoloni, Istituto Nazionale di Geofisica e Vulcanologia; Iain Stewart, University of Plymouth

15:30 - 1297 **KEYNOTE: Communicating Seismic Risk: the geoethical challenges of community-centred, participatory approaches**  
 Iain Stewart and Johanna Ickert - University of Plymouth; Robin Lacassin - Institut de Physique du Globe de Paris

16:00 - 1812 **KEYNOTE: Geoethics as a common thread that binds a geoscience department together**  
 Vincent S. Cronin - Baylor University

16:30 - 1550 **KEYNOTE: Addressing the Ethics Skills Gap through a Co-Curricular Approach**  
 Christopher Keane and Pranoti Asher - American Geosciences Institute



**RS22: The Changing Role of Geological Surveys IV**

**Organizers:** Christian Bohm, Manitoba Geological Survey; Philip Hill, Geological Survey of Canada (GSC); Murray Hitzman, Irish Centre for Research in Applied Geosciences; Daniel Lebel, GSC; Harvey Thorleifson, Minnesota Geological Survey  
**Chairs:** Philip Hill; Murray Hitzman; Daniel Lebel; Harvey Thorleifson

**15:30 - 2448 How will Big Data technologies change Earth science research?**  
 Qiuming Cheng - International Union of Geological Sciences (IUGS)

**15:45 - 2535 AI for Geosciences: Mineral Exploration and Beyond**  
 Max Howarth - IBM Global Business Services

**16:00 - 2482 OneGeology into the Future - 3D geology of the globe**  
 Carina Kemp - Geoscience Australia; Matthew Harrison - British Geological Survey

**16:15 - 2276 OneGeology – 2008-2018 One Successful Decade of Geological Data Sharing**  
 François Robida - French Geological Survey; Ian Jackson - retired

*16:30 Panel Discussion: This session celebrates successes in big data within the international geological survey community, and explores how exciting new technological directions, such as the application of artificial intelligence, will impact next generation geoscience and the geological survey organization of the future.*





<b>RESOURCES AND SOCIETY I</b>		<b>08:30 - 10:00</b>	<b>ROOM 118</b>
RS40:	<b>Sustainable Mineral Resource Management: Role of International Resource / Reserve Reporting Codes</b> Organizer and Chair: Abani Samal, GeoGlobal LLC		
08:30 - 2386	<b>The Australasian JORC Code for Public Reporting of Mineral Resources and Ore Reserves for the Benefit of all Stakeholders</b> Peter Telford Stoker - Australasian Institute of Mining and Metallurgy; Steve Hunt - Rio Tinto; Patrick Stephenson - AMC Mining Consultants (Canada) Ltd.		
08:45 - 2370	<b>Sustainable Development and Disclosure of Mineral Projects – the Canadian Perspective</b> Deborah McCombe - RPA Inc.; Greg Gosson - Wood Group PLC		
09:00 - 2315	<b>Addressing Environmental, Health and Safety Issues for Reporting Mineral Resources and Mineral Reserves</b> Harry Parker - Amec Foster Wheeler; Donald Hulse - Gustavson Consulting; Fred Heivilin - Retired		
09:15 - 2297	<b>Recognition of European Competent Persons for Minerals Reporting</b> Ruth Allington - GWP Consultants LLP, Pan European Reserves and Resources Reporting Committee (PERC), Task Group on Global Geoscience Professionalism; Stephen Henley - PERC; Deborah McCombe - Committee for Mineral Reserves International Reporting Standards; Vitor Ramos Correia - European Federation of Geologists (EFG); Michael Neumann - EFG and PERC		
09:30 - 2271	<b>Mineral Resource and Mineral Reserve Classification Systems in Mongolia</b> Oyungerel Gerlee Bayanjargal, CRIRSCO		
<b>RESOURCES AND SOCIETY II</b>		<b>08:30 - 10:00</b>	<b>ROOM 119</b>
RS12:	<b>Forensic Geology: Ethics, Communication, Regulation, and Opportunities I (IAPG)</b>		
Organizers:	Lorna Dawson, James Hutton Institute; Rosa Maria Di Maggio, Formerly Italian Forensic Police Department; Silvia Peppoloni, Istituto Nazionale di Geofisica e Vulcanologia; Duncan Pirrie, University of South Wales		
Chairs:	Lorna Dawson; Rosa Maria Di Maggio		
08:30 - 2173	<b>KEYNOTE: Ethical considerations in interpreting and communicating geoscience evidence</b> Lorna Anne Dawson - James Hutton Institute; David Parratt - Faculty of Advocates; Derek Auchie - University of Aberdeen		
09:00 - 1520	<b>Murder or fatal accident? Ethic and professionalism managing forensic geology evidence</b> Rosa Maria Di Maggio - Formerly Italian Forensic Police Department; Pier Matteo Barone - American University of Rome		
09:15 - 1488	<b>Forensic Geology in Brazil: police ethics and academic development</b> Fábio Augusto da Silva Salvador - Brazilian Federal Police		
09:30 - 1813	<b>The forensic geosciences potential in the lesson learned approach, which increases the collective security and decreases fatalities in disasters</b> MarÁa Margarita Zango Pascual - Universidad Pablo de Olavide, Sevilla		



RESOURCES AND SOCIETY III		08:30 - 10:00	ROOM 120
RS29:	<b>International Mechanisms for Addressing Mineral Supply for Global Environmental Change I</b>		
Organizers:	Saleem Ali, University of Delaware; Maria Baptista, United Nations Environment Programme (UNEP); Rene Kleijn, Leiden University; Edmund Nickless, International Union of Geological Sciences; Janet Salem, UNEP		
Chairs:	Saleem Ali; Rene Kleijn; Edmund Nickless		
08:30 - 1101	<b>KEYNOTE: Resource Governance - Developing an Effective Role for Science Institutions</b> Saleem Ali – University of Delaware		
09:00 - 2225	<b>KEYNOTE: The materials-energy-climate nexus</b> Ester van der Voet and René Kleijn - Leiden University; Gavin Mudd - RMIT University; Lauran van Oers - Leiden University		
09:30 - 1840	<b>Global trends in resource demand for technological shift in the automotive industry from the viewpoint of Total Material Requirement</b> Kazuyo Matsubae and Kenyu Matsui - Tohoku University; Shoki Kosai and Eiji Yamasue - Ritsumeikan University; Tetsuya Nagasaka - Tohoku University		

RESOURCES AND SOCIETY IV		08:30 - 10:00	ROOM 121
RS22:	<b>The Changing Role of Geological Surveys V</b>		
Organizers:	Christian Bohm, Manitoba Geological Survey; Philip Hill, Geological Survey of Canada (GSC); Murray Hitzman, Irish Centre for Research in Applied Geosciences; Daniel Lebel, GSC; Harvey Thorleifson, Minnesota Geological Survey		
Chairs:	Philip Hill; Murray Hitzman; Daniel Lebel; Harvey Thorleifson		
08:30 - 2060	<b>KEYNOTE: Building the Future for Geoscience Community in Asia: CCOP and KIGAM beyond History &amp; Borders</b> Young Joo Lee - Korea Institute of Geoscience and Mineral Resources (KIGAM)		
09:00 - 2151	<b>CCOP Transboundary Geoscience Programs in Southeast Asia</b> Adichat Surinkum - Coordinating Committee for Geoscience Programs in East and Southeast Asia (CCOP)		
09:15 - 1394	<b>Building geological capacity - considerations based on BGR's engagement in geoscientific development assistance in Asia</b> Arne Hoffmann-Rothe - Federal Institute for Geosciences and Natural Resources (BGR)		
09:30 - 1299	<b>Surveys and systems: rising to the challenge of multi-disciplinarity</b> Martin Smith - British Geological Survey		

RESOURCES AND SOCIETY II		10:30 - 12:00	ROOM 119
RS12:	<b>Forensic Geology: Ethics, Communication, Regulation, and Opportunities II (IAPG)</b>		
Organizers:	Lorna Dawson, James Hutton Institute; Rosa Maria Di Maggio, Formerly Italian Forensic Police Department; Silvia Peppoloni, Istituto Nazionale di Geofisica e Vulcanologia; Duncan Pirrie, University of South Wales		
Chairs:	Lorna Dawson; Rosa Maria Di Maggio		
10:30 - 1335	<b>KEYNOTE: Current and future opportunities for developing the use of Geographical Information Science to inform Forensic Search Strategies</b> Jennifer McKinley - Queens University Belfast		
11:00 - 1624	<b>The use of natural isotope signatures in geographical authentication casework; academic practice versus legal standards</b> Jurian Hoogewerff - University of Canberra; Wolfram Meier-Augestein - Robert Gordon University		



11:15 - 1406 **Urban Soil and the Ethics of Disclosure**  
Elisa Bergslien – State University of New York Buffalo State

11:30 - 1006 **Working with Non-optimal Soil Evidence in Casework: An Example from a Homicide Case in Southern California, USA**  
Marianne Stam - Retired

11:45 *Panel Discussion*

**RESOURCES AND SOCIETY III 10:30 - 12:00 ROOM 120**

RS29: **International Mechanisms for Addressing Mineral Supply for Global Environmental Change II**

**Organizers:** Saleem Ali, University of Delaware; Maria Baptista, United Nations Environment Programme (UNEP); Rene Kleijn, Leiden University; Edmund Nickless, International Union of Geological Sciences; Janet Salem, UNEP

**Chairs:** Rene Kleijn; Edmund Nickless

10:30 - 1426 **Social impacts assessment in the extractive industry in Russia and the compensations for impact on indigenous peoples of the North**  
Natalia Yakovleva - Newcastle University London; Tuyara Gavrilieva - North Eastern Federal University; Tatiana Mostakhova and Nikita Bochkarev - Siberian Branch of the Russian Academy of Sciences

10:45 - 2184 **KEYNOTE: Resourcing Future Generations: a new IUGS initiative**  
Edmund Nickless - International Union of Geological Sciences (IUGS)

11:15 *Panel Discussion: This session will consider how international institutions are evolving to address both the research needs and governance mechanisms for mineral supply concerns. The first part of the session will be a provocative discussion on the prospects for international agreements on mineral supply coordination and driving home some of the lessons for existing organizations such as the UN International Resource Panel and the Intergovernmental Forum on Mining, Metals and Sustainable Development. The second part will address specific ways in which minerals supply and climate change concerns are manifest and use this global environmental change challenge as a way of operationalizing concerns about international mechanisms of resource governance. This panel discussion will be moderated by Edmund Nickless, Chair of the IUGS New Activities Strategic Implementation Committee. Panelists will include Rene Kleijn. Background reading: Nickless, 2018. Resourcing future generations: A contribution by the earth science community. Natural Resources Research 27:143. Ali et al., 2017. Mineral supply for sustainable development requires resource governance: Nature, 543:367.*

**RESOURCES AND SOCIETY IV 10:30 - 12:00 ROOM 121**

RS22: **The Changing Role of Geological Surveys VI**

**Organizers:** Christian Bohm, Manitoba Geological Survey; Philip Hill, Geological Survey of Canada (GSC); Murray Hitzman, Irish Centre for Research in Applied Geosciences; Daniel Lebel, GSC; Harvey Thorleifson, Minnesota Geological Survey

**Chairs:** Philip Hill; Murray Hitzman; Daniel Lebel; Harvey Thorleifson

10:30 - 2536 **International geoscience programme, in the service of the Society since 1972**  
Ozlem Adiyaman - UNESCO

10:45 - 2335 **International capability building between geological surveys**  
Eimear Deady - University of Exeter and British Geological Survey; Leanne Hughes, Joseph Mankelov and Gus Gunn - British Geological Survey



11:00 - 2228 **Contribution of a Geological Service for Europe to Smart, Sustainable and Inclusive Growth**  
 Slavko Solar, Patrick Wall and Jelena Vidovic - EuroGeoSurveys; Yvonne Schavemaker - Geological Survey of the Netherlands

11:15 - 1389 **Building sustainable development in Canadian natural resources through multi-disciplinary partnerships in federal government geoscientific programs**  
 Victoria Tschirhart, Skipton Diane, Benoit Saumur and Eric Potter - Geological Survey of Canada; Donna Kirkwood - Natural Resources Canada

11:30 - 1728 **Geological Survey, A Global Geological Initiation for Young Earth Scientists**  
 Meng Wang - University of Chinese Academy of Sciences, Young Earth Scientists (YES) Network; David Govoni - Unicalce Group; Liangliang Wang - China Geological Survey

11:45 *Panel Discussion*

**RESOURCES AND SOCIETY I 13:30 - 15:00 ROOM 118**

RS18: **Preserving Geoscience Data for Decision Making Tomorrow**  
 Organizers: Christopher Keane and Sharon Tahirkheli, American Geosciences Institute  
 Chair: Christopher Keane

13:30 - 1014 **Open data policy in the Earth Sciences: exploring its application across the government, scientific and industry sectors in Australia**  
 Trisha Moriarty - Geological Survey of New South Wales

13:45 - 1686 **Making a whole from a hole: Maximising the value of the UK national borehole archive**  
 Katie Whitbread, Garry Baker, Diarmad Campbell, Hugh Barron, Helen Bonsor and Holger Kessler - British Geological Survey

14:00 - 1668 **A new NetCDF4/HDF5 format using Linked Data for magnetics, radiometrics, gravity and airborne electromagnetic data**  
 Carina Kemp, Alex Ip, Brodie Ross and Yvette PoudjomDjomani - Geoscience Australia

14:15 *Panel Discussion*

**RESOURCES AND SOCIETY II 13:30 - 15:00 ROOM 119**

RS30: **Classification, Management, and Sustainable Development of the Global Resource Endowment - Unification and Standardization of Terminology and Practice**  
 Organizers: Kaiser de Souza, United Nations Economic Commission for Africa; Martin Fairclough, International Atomic Energy Agency; Mark Mihalasky, U.S. Geological Survey; Harikrishnan Tulsidas, United Nations Economic Commission for Europe  
 Chair: David Elliott, retired

13:30 - 2323 **KEYNOTE: Contrasting and complementary roles of CRIRSCO reporting standards and the UNFC in the minerals industry and other resource management**  
 Ruth Allington - GWP Consultants LLP, Pan European Reserves and Resources Reporting Committee (PERC), Task Group on Global Geoscience Professionalism; Roger Dixon - Committee for Mineral Reserves International Reporting Standards; Stephen Henley - PERC; Michael Neumann - European Federation of Geologists and PERC

14:00 - 2105 **Social and Environmental Aspects of Resource Classification**  
 David Crompton Elliott - retired

14:15 - 2286 **CRIRSCO compliant reporting code and sustainable mining in India**  
 Abani Ranjan Samal - GeoGlobal LLC; Polavarapu Venkateswara Rao - Behre Dolbear

14:30 - 1544 **The need for separate reporting terminologies for reporting the results of strategic studies and project evaluations of mineral projects**  
 Edmund John Sides - Orebody Risks Limited



14:45 - 2104 **The United Nations Framework Classification for Resources (UNFC)**  
David Crompton Elliott - retired

**RESOURCES AND SOCIETY III****13:30 - 15:00****ROOM 120**

RS6: **Social Geology Applied to Mineral Resources**

**Organizers and Chairs:** Yann Gunzburger, University of Lorraine; Michel Jébrak, Université du Québec à Montréal

13:30 - 1844 **Modelling a public debate on a mining project: getting it right about actors and key issues?**

Jean-Alain Fleurisson - PSL Research University; Kristina Maud Bergeron - Université du Québec à Montréal; Patricia Fraile and Alexis Geisler - PSL Research University; Michel Jébrak - Université du Québec à Montréal

13:45 - 1150 **What can 100 mining exploration projects in Canada tell us about social geology?**

Kristina Maud Bergeron and Michel Jébrak - Université du Québec à Montréal

14:00 - 1761 **Dynamic, Multi-Perspective and Multi-Scale Risk Assessment of Mining Projects under Tropical Climate, in both their Geoscientific and Social Dimension**

Ottone Scammacca, Yann Gunzburger and Rasool Mehdizadeh - Université de Lorraine

14:15 - 1569 **Social geology applied to the resilience of greenstone belt mining ecosystems**

Michel Jébrak and Jébrak Yona - Université du Québec à Montréal

14:30 - 1543 **Coal seam gas: a lever for a possible revitalization of the former French Lorraine coalfield**

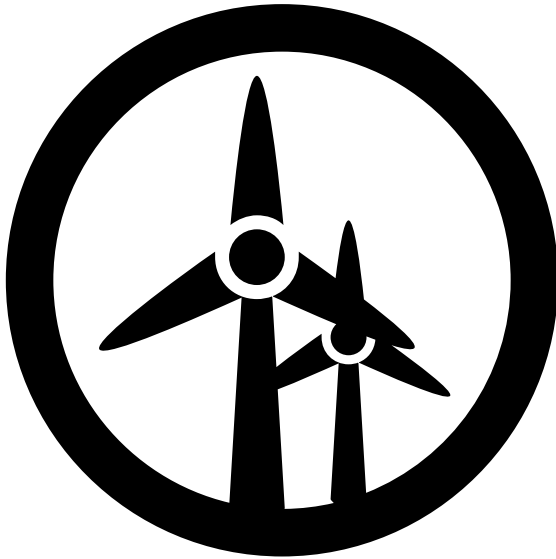
Yann Beauloye, Michel Deshaies and Yann Gunzburger - Université de Lorraine

14:45 - 1211 **Exploring Manganese in East Nusa Tenggara, Indonesia: A Social Geology Approach**

Maribeth Erb Mucek - National University of Singapore; Adonara Elizabeth Mucek - Oregon State University







TECHNICAL PROGRAM

# ENERGY

**ENERGY** **10:30 - 12:00** **ROOM 122**

**EN3:** Energy and Technology  
**Organizer:** Mark Cooper, Sherwood GeoConsulting  
**Chair:** Clinton Tippett, Canadian Society of Petroleum Geologists

**10:30 - 2391** **Techno-economic assessment of using alternative energy technologies for remote mining applications**  
 Brennan Cicierski - Reykjavik University; Ali Madiseh-Ghoreshi - University of British Columbia

**10:45 - 1819** **Developing surficial geological siting criteria for Small Modular Reactors (SMR) in Saskatchewan, Canada**  
 Matt Thompson, Janis Dale, Kathryn Bethune and Stephen Bend - University of Regina

**11:00 - 2168** **Environmental screening of electrode materials for rechargeable aluminium batteries**  
 Linda Ager-Wick Ellingsen - The Norwegian University of Science and Technology (NTNU)

**11:15 - 1036** **Preparing for and promoting the economic & social development of the sub-tropical zones**  
 Michael Sudbury - retired

**ENERGY** **13:30 - 15:00** **ROOM 122**

**EN10:** Geothermal Solutions for Northern Regions, Mines, and Other Remote Areas  
**Organizers:** Felix-Antoine Comeau, Michel Malo and Jasmin Raymond, Institut National De La Recherche Scientifique  
**Chair:** Michel Malo

**13:30 - 2429** **Nunavut Geothermal Feasibility Study**  
 Matthew Minnick and Debra Shewfelt - RESPEC; Catherine Hickson - Tuya Terra Geo Corp.

**13:45 - 1936** **Preliminary assessment of geothermal energy potential of active mines in Northern Quebec**  
 Felix-Antoine Comeau, Jasmin Raymond and Michel Malo - Institut national de la recherche scientifique (INRS)

**14:00 - 2111** **Geothermal energy potential of active mines in northern regions: The Éléonore Mine case study**  
 Edgardo Alvarado and Jasmin Raymond - Institut national de la recherche scientifique (INRS); René Therrien - Université Laval; Félix-Antoine Comeau - INRS; David Labrecque - Goldcorp

**14:15 - 1446** **Sustainable production and consumption of energy, water and food through geothermal resources. Nunavik communities case study, Northern Québec, Canada**  
 Mafalda Miranda, Nicolò Giordano, Inès Kanzari and Jasmin Raymond - Institut national de la recherche scientifique (INRS); Chrystel Dezayes - French Geological Survey

**ENERGY** **15:30 - 17:00** **ROOM 122**

**EN4:** Global Shale: Resources, Economics, and Environmental Challenges  
**Organizers and Chairs:** Elizabeth Eide, National Academies of Sciences, Engineering, and Medicine; Svetlana Ikonnikova, University of Texas





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- 15:30 - 2353 **Environmental Solutions for Up and Mid-Stream Shale Development**  
Michelle McGregor - The Nature Conservancy
- 
- 15:45 - 2139 **Nirvana Frameworks for Petroleum Exploration and Production**  
Barry Alan Goldstein - State Government of South Australia
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- 16:00 - 1445 **Microbial Community Dynamics in Flowback and Produced Water from Unconventional Hydrocarbon Wells**  
Cheng Zhong - University of Alberta; Jiaying Li - University of Calgary; Shannon Flynn - Newcastle University; Camilla Nesbø, Chenxin Sun, Konstantin von Gunten, Brian Lanoil, Greg Goss, Jonathan Martin and Daniel Alessi - University of Alberta
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- 16:15 - 1898 **Helium Resources and Potential of the Phanerozoic Western Canada Sedimentary Basin, Southern Saskatchewan**  
Melinda Yurkowski, Gary Delaney, Jason Berenyi and Ryan Morelli - Saskatchewan Geological Survey
- 
- 16:30 - 1250 **Geological indicators of carbonaceous mudstone in Wales and the challenge of communication Shale Gas potential**  
David Schofield and Rhian Kendall - British Geological Survey



ENERGY	08:30 - 10:00	ROOM 122
EN5: Organizers: Chair:	<b>Marine Geosciences and Energy Resources for Future Generations</b> Vaughn Barrie, Lynn Dafeo, Michael Li and Gwyn Lintern, Geological Survey of Canada Michael Li	
08:30 - 1315	<b>Marine renewable energy development: why geological and geophysical site characterization is important</b> Philip Hill - Geological Survey of Canada	
08:45 - 1291	<b>How understanding past landscapes can inform present day site investigations: A case study from Dogger Bank</b> Carol Cotterill and Emrys Phillips - British Geological Survey; Leo James - RPS Energy; Carl Fredrik Forsberg - NGI; Tor Inge Tgelta - Statoil	
09:00 - 1258	<b>Near-bed currents and sediment erosion potential on the shelf break and upper slope of Canadian Beaufort Sea – a regional synthesis</b> Michael Li and Edward King - Geological Survey of Canada; Alexandre Forest - Laval University; Humfrey Melling - Fisheries and Oceans Canada	
09:15 - 1905	<b>Exploration of the West Orphan Basin – An Integrated Seep Hunting and Geochemical Sampling Approach</b> Garrett Alan Mitchell, Jessica Grenader, Stephanie Ingle and Jamshid Gharib - Fugro	
09:30 - 2414	<b>MLA-SEM and Fluid Inclusion Analyses – A twin-track approach to the study of cuttings from offshore Newfoundland and Labrador</b> Derek Wilton - Memorial University of Newfoundland; Martin Feely, Alessandra Costanzo and Jon Hunt - NUIG; David Norris - Nalcor Energy	
ENERGY	10:30 - 12:00	ROOM 122
EN2: Organizer and Chair:	<b>Energy Futures I</b> Richard Chuchla, University of Texas	
10:30 - 1084	<b>The Long-Term Role of Energy and Food in the Economy and Future Implications</b> Carey King - University of Texas at Austin	
10:45 - 1887	<b>An intelligent grid as an imperative to accelerate the transition to a sustainable energy ecosystem</b> Adriaan Davidse - Deloitte Inc.	
11:00 - 1501	<b>A methodology for bringing transparency to complex future energy scenarios: case study of the IPCC database</b> Justin Ritchie and Hadi Dowlatabadi - Institute for Resources, Environment and Sustainability	
11:15 - 2389	<b>A Millennial View of the Importance of Liquids Rich Natural Gas and Light Tight Oil to Canada's Energy Future</b> Kristin Krawec - Encana Corporation	
11:30 - 2262	<b>Modelling System for Undiscovered Hydrocarbon Accumulations: A stochastic geometry approach</b> Erik Anderson - Entrepreneur	
11:45 - 1375	<b>Historical and Possible Future Trends in Global Uranium Supply and Demand</b> Adrienne Hanly - International Atomic Energy Agency	



ENERGY		13:30 - 15:00	ROOM 122
EN2:	<b>Energy Futures II</b>		
Organizer and Chair:	Richard Chuchla, University of Texas		
13:30 - 1360	<b>A hybrid system for energy storage which integrates Zn deposition and Cu leaching processes</b> Kashif Mairaj Deen and Edouard Asselin - University of British Columbia		
13:45 - 2277	<b>Integrated raw materials value chains – the Clean Coal Project of Hungary</b> Mária Hámorné Vidó - University of Pécs		

ENERGY		15:30 - 17:00	ROOM 122
EN8:	<b>The Role of Geoenergy Test Beds in Developing Future Energy Systems</b>		
Organizers:	Andrew Beaton, Alberta Geological Survey; Michelle Bentham, British Geological Survey; Kevin Parks, Alberta Geological Survey		
Chairs:	Andrew Beaton; Michelle Bentham		
15:30 - 1477	<b>EPOS and ECCSEL: Geoenergy Test Beds in European Distributed Research Infrastructures</b> Helen Taylor, David Schofield, Jonathan Pearce and Ceri Vincent - British Geological Survey		
15:45 - 1397	<b>The UK GeoEnergy Test Bed research platform</b> Ceri Vincent - British Geological Survey; Matthew Hall - University of Nottingham		
16:00 - 1571	<b>UK Geoenergy Observatories project - Creating two new geoenergy research test beds</b> Geoff Baxter and Michael Stephenson - British Geological Survey		
16:15 - 1721	<b>In-situ Stimulation and Circulation Experiment as a Decameter Geo-Energy Test Bed for Enhanced Geothermal System Development</b> Mohammadreza Jalali and Joseph Doetsch - ETH Zurich; Valentin Gischig - CSD Engineers; Florian Amann - RWTH Aachen University; Benoît Valley - University of Neuchatel; Hannes Krietsch - ETH Zurich; Nathan Dutler - University of Neuchatel; Linus Villiger, Bernard Brixel, Anniina Kittilä and Domenico Giardini - ETH Zurich		
16:30 - 2112	<b>Hydrogeological characterization of the Aquistore site: Canada's first CO<sub>2</sub> storage project associated with a commercial-scale coal-fired power plant</b> Ben Rostron - University of Alberta		
16:45 - 1990	<b>The University of Regina GeothURmal Project: A deep geothermal energy demonstration project in Saskatchewan</b> Janis Elaine Dale - University of Regina; Brian Brunskill - Helix Geological Consultants; Amr Henni and Katherine Arbuthnott - University of Regina		



ENERGY		08:30 - 10:00	ROOM 122
EN14:	<b>Unconformity-Related Uranium Deposits, with a Focus on the Southwest Athabasca Basin (Canada) - I</b>		
Organizers:	Kevin Ansdell, University of Saskatchewan; Mostafa Fayek, University of Manitoba		
Chairs:	Kevin Ansdell; Colin Card, Saskatchewan Geological Survey; Khalifa Eldursi, University of Regina; Sean Hillacre, University of Saskatchewan		
08:30 - 1194	<b>50 years and C\$3B in exploration expenditures - an analysis of Exploration Techniques in the Athabasca Basin</b>		
	Roger Hugh Wallis - Roger Wallis and Associates-Geological Consultants		
08:45 - 2203	<b>KEYNOTE: What Does an Athabasca Basin Uranium Deposit Footprint Look Like?</b>		
	David Thomas, Alexandre Aubin and Gerard Zaluski - Cameco Corporation		
09:15 - 1020	<b>Geochemistry of the Athabasca Basin, Saskatchewan, Canada, and the unconformity-related uranium deposits hosted by it</b>		
	Paul Alexandre - Brandon University		
09:30 - 1779	<b>Numerical modeling of the effects of basement fault configuration on fluid flow pattern and significance for unconformity-related uranium deposits</b>		
	Khalifa M. Eldursi, Guoxiang Chi, Kathryn Bethune and Zenghua Li - University of Regina; Patrick Ledru and David Quirt - AREVA Resources Canada Inc.		
09:45 - 1772	<b>Numerical Investigation into Relative Importance of Graphite and Fe-rich Chlorite as Reducing Agents in the Formation of Unconformity-related Deposits</b>		
	Jianwen Yang - University of Windsor; Yousef Beiraghdar Aghbelagh - Waterline Resources Inc.		
ENERGY		10:30 - 12:00	ROOM 122
EN14:	<b>Unconformity-Related Uranium Deposits, with a Focus on the Southwest Athabasca Basin (Canada) - II</b>		
Organizers:	Kevin Ansdell, University of Saskatchewan; Mostafa Fayek, University of Manitoba		
Chairs:	Kevin Ansdell; Colin Card, Saskatchewan Geological Survey; Khalifa Eldursi, University of Regina; Sean Hillacre, University of Saskatchewan		
10:30 - 1776	<b>Zonation of mineralization and alteration of unconformity-related uranium deposits revealed by coupled fluid flow and chemical reaction modelling</b>		
	Zenghua Li, Guoxiang Chi, Kathryn Bethune and Khalifa Eldursi - University of Regina; David Quirt and Patrick Ledru - AREVA Resources Canada Inc.		
10:45 - 2204	<b>Kintyre Uranium Deposit – Proterozoic Unconformity-related or Metamorphic Vein Deposit?</b>		
	David Thomas - Cameco Corporation; Penny Sinclair - Consultant; Damien Ewington - Cameco Corporation		
11:00 - 2369	<b>Overview of the geology, origin, and evolution of the Centennial uranium deposit, south-central Athabasca Basin, Saskatchewan, Canada</b>		
	Kyle Reid - Manitoba Geological Survey; Kevin Ansdell - University of Saskatchewan		
11:15 - 1726	<b>KEYNOTE: Western Athabasca Basin - New Discoveries in an Old Mining District</b>		
	Craig Cutts - AREVA Resources Canada Inc.; John Robbins, Dwayne Morrison, David Quirt, Patrick Ledru and Gregory Bell - Orano Canada Inc.		



<b>ENERGY</b>		<b>13:30 - 15:00</b>	<b>ROOM 122</b>
<b>EN14:</b>	<b>Unconformity-Related Uranium Deposits, with a Focus on the Southwest Athabasca Basin (Canada) - III</b>		
<b>Organizers:</b>	Kevin Ansdell, University of Saskatchewan; Mostafa Fayek, University of Manitoba		
<b>Chairs:</b>	Kevin Ansdell; Colin Card, Saskatchewan Geological Survey; Khalifa Eldursi, University of Regina; Sean Hillacre, University of Saskatchewan		
<b>13:30 - 1197</b>	<b>Uranium Geology of the Southwest Athabasca Basin</b> Troy Boisjoli - NexGen Energy Ltd.		
<b>13:45 - 1793</b>	<b>KEYNOTE: Are uranium deposits of the Athabasca Basin more closely related to unconformities or to deep-seated structural control?</b> Colin Card, Sean Bosman and Gary Delaney - Saskatchewan Geological Survey		
<b>14:15 - 2095</b>	<b>Uraninite Geochronology of the Arrow Uranium Deposit, Patterson Lake corridor, Athabasca Basin, Saskatchewan</b> Sean Hillacre and Kevin Ansdell - University of Saskatchewan; Galen McNamara - NexGen Energy Ltd.; Mostafa Fayek - University of Manitoba		
<b>14:30 - 1567</b>	<b>Characterization of fluids associated with uranium mineralization in the Patterson Lake area: a preliminary fluid inclusion study</b> Morteza Rabiei and Guoxiang Chi - University of Regina; Eric Potter and Victoria Tschirhart - Geological Survey of Canada; Cameron MacKay and Scott Frostad - Purepoint Uranium Group Inc.; Ross McElroy and Raymond Ashley - Fission Uranium Corp.		
<b>14:45 - 1807</b>	<b>Phanerozoic stratigraphy of the Patterson Lake area, southwest margin of the Athabasca Basin Saskatchewan: Implications for uranium exploration</b> Sean Bosman, Colin Card and Gary Delaney - Saskatchewan Geological Survey		

<b>ENERGY</b>		<b>15:30 - 17:00</b>	<b>ROOM 122</b>
<b>EN11:</b>	<b>Geothermal Energy in the 21st Century</b>		
<b>Organizers:</b>	Stuart Simmons, University of Utah; Jeff Tester, Cornell University		
<b>Chair:</b>	Jeffrey Bielicki, Ohio State University		
<b>15:30 - 2280</b>	<b>Geothermal Evaluations of British Columbia: Direct Use Applications</b> Catherine Jean Hickson - Tuya Terra Geo Corp.; Yuliana Proenza - Apex Geoscience; Gerry Hutterer - Geothermal Management Company; Ron Yehia - MYAR Consulting; Jacek Majorowicz - Tuya Terra Geo Corp.; John Lund and Toni Boyd - Geothermal Management Company; Glenn Woodsworth, Titi Kunkel, Michal Moore and Leah Hjorth - Tuya Terra Geo Corp.		
<b>15:45 - 2412</b>	<b>Optimally Extracting Geothermal Heat from Sedimentary Basins Using Stored Carbon Dioxide</b> Jeffrey M. Bielicki and Jonathan Ogland-Hand - Ohio State University		
<b>16:00 - 2362</b>	<b>Thermo-dynamic ground modelling - an innovative approach for London</b> Steve Thorpe - British Geological Survey; Asal Bidarmaghz - Cambridge University; Ricky Terrington and Holger Kessler - British Geological Survey; Ruchi Choudhary - Cambridge University		
<b>16:15 - 1282</b>	<b>Geothermal heat conversion directly to electricity</b> Gordon M. Grunden - Blue Sky Sciences, Inc.		
<b>16:30 - 1085</b>	<b>Toward an exploration method for sedimentary basins and basement</b> Chrystel Dezayes - French Geological Survey		

16:45 - 2310 **DEEP Sedimentary Geothermal Power Generation in Saskatchewan**  
 Matthew Minnick - RESPEC  
 Kirsten Marcia - DEEP Earth Energy Corp.

**ENERGY** **08:30 - 10:00** **ROOM 122**

EN12: **New Innovations in Geothermal Exploration**  
 Organizer  
 and Chair: Stephen Grasby, Geological Survey of Canada

08:30 - 1917 **Optimized Geothermal Exploration: Next Generation of Exploration**  
 Craig Dunn - Consultant

08:45 - 1410 **Interpretation of new geophysical data in the Grenville Province, the St. Lawrence Lowlands, and the Appalaches: implications for deep geothermal energy**  
 Aurélie Gicquel, Lyl Harris and Bernard Giroux - Institut National de la Recherche Scientifique (INRS)

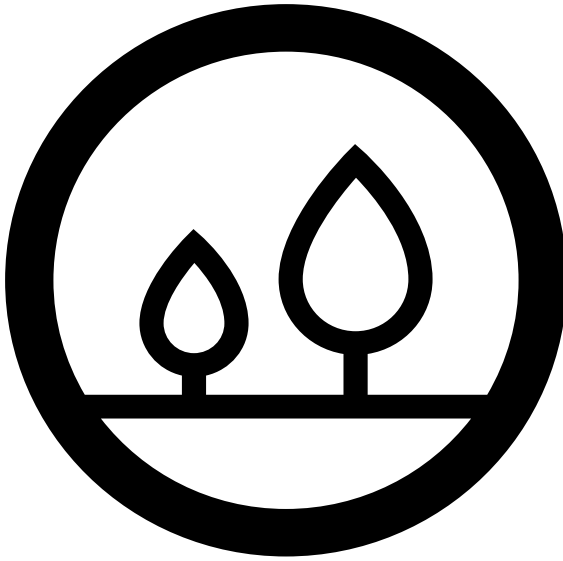
09:00 - 1450 **Curie Point Depth Mapping as a Regional-Scale Geothermal Prospecting Tool in the British Columbia Cordillera**  
 Jeffrey Witter - Innovate Geothermal Ltd.

09:15 - 1773 **Use and abuse of thermals springs as a geothermal exploration tool**  
 Stephen Grasby - Geological Survey of Canada; Grant Ferguson - University of Saskatchewan

09:30 - 2477 **De-risking Geothermal Energy Prospects in Karst: A UK Study**  
 Nadia Narayan, Jon Gluyas, Charlotte Adams and Jonathan Imber - Durham University

09:45 - 2257 **A new frontier for deep geothermal exploitation in the granites of Southwest England**  
 Peter Ledingham and Lucy Cotton - GeoScience Ltd.; Iain Stewart - Plymouth University





TECHNICAL PROGRAM

# THE EARTH



THE EARTH

**THE EARTH I** **10:30 - 12:00** **ROOM 203**

<b>EA3:</b>	<b>Geo-Engineering and Earth Sciences: Integration Opportunities</b>
<b>Organizer and Chair:</b>	Stephen Morison, Geological Association of Canada
<b>10:30 - 2487</b>	<b>Applied Earth Science Practice in a Changing Climate</b> Lukas Arenson - BGC Engineering Inc.
<b>10:45 - 2350</b>	<b>OGC GeoScience Domain Working Group: A forum to enhance and organize geoscience data standardization</b> Mickaël Beauflis - BRGM; Carina Kemp - GeoScience Australia
<b>11:00 - 1545</b>	<b>Risk-based geo-engineering to close the gap between the mine and the corporate office</b> John Whittall and Warren Newcomen - BGC Engineering Inc.
<b>11:15 - 1272</b>	<b>Effect of different Mg-silicate materials on mineral carbonation efficiency of CO<sub>2</sub> sequestration</b> Fei Wang and David Dreisinger - University of British Columbia; Mark Jarvis and Tony Hitchins - Giga Metals Corporation

**THE EARTH II** **10:30 - 12:00** **ROOM 204**

<b>EA22:</b>	<b>Geochronology and Mineralogy of Crusts and their Ores using Emerging Techniques I</b>
<b>Organizers:</b>	Tom Al, University of Ottawa; Fernando Corfu, University of Oslo; Christopher McFarlane, University of New Brunswick; Desmond Moser, University of Western Ontario; Jeanne Percival, Geological Survey of Canada
<b>Chairs:</b>	Tom Al; Desmond Moser; Jeanne Percival
<b>10:30 - 2441</b>	<b>A new melanite garnet age from the Crowsnest Formation, southwestern Alberta</b> Chris McFarlane, Robin Adair and David Lentz - University of New Brunswick
<b>10:45 - 1923</b>	<b>Evaluating exhumation models of the (ultra-)high pressure Western Gneiss Complex in Norway using the U-Pb rutile (thermo-)chronometer</b> Jamie Cutts and Matthijs Smit - University of British Columbia; Ellen Kooijman and Melanie Schmitt - Swedish Museum of Natural History
<b>11:00 - 1872</b>	<b>Th/U ratios in high-temperature metamorphic zircon</b> Chris Yakymchuk - University of Waterloo; Christopher Kirkland and Chris Clark - Curtin University
<b>11:15 - 1995</b>	<b>New and reoccurring challenges for geochronology in the magmatic-hydrothermal environment</b> Simon Tapster and Dan Condon - NIGL British Geological Survey

**THE EARTH III** **10:30 - 12:00** **ROOM 205**

<b>EA17:</b>	<b>Integrated Geosciences for Regional Geology: Geophysics, Remote Sensing and Field Mapping I</b>
<b>Organizers:</b>	Peter Bobrowsky, Geological Survey of Canada (GSC); James Conliffe, Geological Survey of Newfoundland and Labrador; Vern Singhroy, Canada Centre for Mapping and Earth Observation; Victoria Tschirhart, GSC; Hernan Ugalde, Brock University
<b>Chairs:</b>	Vern Singhroy; Victoria Tschirhart; Hernan Ugalde
<b>10:30 - 1225</b>	<b>The Bathurst Mining Camp, New Brunswick, Canada: 3D integration of geophysical data and implications for exploration</b> Hernan Ugalde - Brock University; Bill Morris - McMaster University; Cees Van Staal - Geological Survey of Canada; Peter Tschirhart - Paterson, Grant & Watson Limited





10:45 - 1222	<b>An overview of Boothia Peninsula - Somerset Island, Northern Nunavut, derived from airborne magnetic, remote sensing and petrophysical data</b> Hernan Ugalde - Brock University; Mary Sanborn-Barrie and Daniele Regis - Geological Survey of Canada; Bill Morris - McMaster University; Gregory Skiba and Francisco Amaya - Brock University
11:00 - 1221	<b>Nonacho Basin Tectonics: Insights from Airborne Magnetics</b> Hernan Ugalde - Brock University; Beth Fischer - Northwest Territories Geological Survey; Iris Lenauer - University of Toronto; Edith Martel - Northwest Territories Geological Survey
11:15 - 1146	<b>Fracture framework mapping from magnetics: The Schultz Lake Igneous Complex</b> William A. Morris - McMaster University; Victoria Tschirhart and Charlie Jefferson - Geological Survey of Canada; Hernan Ugalde - Brock University

<b>THE EARTH LECTURES</b>	<b>11:30 - 12:00</b>	<b>ROOM 302</b>
<b>Geological Association of Canada (GAC) Presidential Address</b> Stephen Morison, GAC President 2017-2018.		

<b>THE EARTH LECTURES</b>	<b>13:30-14:00</b>	<b>ROOM 302</b>
<b>GAC Logan Medalist Address</b> Barbara Sherwood Lollar, University of Toronto		

<b>EARTH I</b>	<b>13:30 - 15:00</b>	<b>ROOM 203</b>
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<b>EA8:</b>	<b>Resources in Paleozoic Orogenic Belts and Associated Sedimentary Basins: Challenges and Opportunities for Multidisciplinary Tectonics I</b>
<b>Organizers:</b>	Sandra Barr, Acadia University; Cees van Staal, Geological Survey of Canada; John Waldron, University of Alberta; Chris White, Nova Scotia Government
<b>Chairs:</b>	Sandra Barr; Gabriel Sombini dos Santos, Acadia University; Alison Thomas, University of Alberta; Chris White

14:00 - 1634	<b>KEYNOTE: Sedimentary basins record diachronous development of the Paleozoic Laurentian margin in the northern Appalachians and Caledonides</b> John W.F. Waldron, Shawna White and Robert Dokken - University of Alberta
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14:30 - 1337	<b>From field mapping to resource evaluation: building integrated geological maps and database for Cape Breton Island, Nova Scotia, Canada</b> Sandra M. Barr - Acadia University; Chris White, Angie Barras and Jeff Poole - Nova Scotia Department of Natural Resources
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14:45 - 1437	<b>Petrology, age, and tectonic setting of the Margaree pluton, Aspy terrane, Cape Breton Island, Nova Scotia, Canada</b> Gabriel Sombini dos Santos and Sandra Barr - Acadia University; Chris White - Nova Scotia Department of Natural Resources; Deanne van Rooyen - Cape Breton University
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<b>THE EARTH II</b>	<b>13:30 - 15:00</b>	<b>ROOM 204</b>
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<b>EA22:</b>	<b>Geochronology and Mineralogy of Crusts and their Ores using Emerging Techniques II</b>
<b>Organizers:</b>	Tom Al, University of Ottawa; Fernando Corfu, University of Oslo; Christopher McFarlane, University of New Brunswick; Desmond Moser, University of Western Ontario; Jeanne Percival, Geological Survey of Canada
<b>Chairs:</b>	Tom Al; Desmond Moser; Jeanne Percival

14:00 - 1667	<b>Garnet chronology: precision and new avenues for elucidating the dynamics of the deep crust and mantle</b> Matthijs Smit - University of British Columbia; Erik Scherer - Westfälische Wilhelms-Universität, Münster; Jamie Cutts - University of British Columbia
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- 14:15 - 1976 **In situ U-Pb Geochronology of Accessory Minerals at the Cantung W-Cu skarn, NWT: examining implications for various mineralizing events**  
Carlin Lentz and Chris McFarlane - University of New Brunswick; Hendrik Falck - Northwest Territories Geological Survey
- 14:30 - 1408 **In situ LA-ICPMS U-Pb Dating of Cassiterite: Examples from worldwide rare metal deposits spanning the Archean to Tertiary**  
Christopher Holm-Denoma, Leonid Neymark and Richard Moscati - U.S. Geological Survey
- 14:45 - 2245 **Electron-backscatter diffraction: Application to mineral characterization, twinning and intergrowth textures**  
Andrew M. McDonald and William Zhe - Laurentian University

**THE EARTH III 13:30 - 15:00 ROOM 205**

- EA17: Integrated Geosciences for Regional Geology: Geophysics, Remote Sensing and Field Mapping II**
- Organizers:** Peter Bobrowsky, Geological Survey of Canada (GSC); James Conliffe, Geological Survey of Newfoundland and Labrador; Vern Singhroy, Canada Centre for Mapping and Earth Observation; Victoria Tschirhart, GSC; Hernan Ugalde, Brock University
- Chairs:** Vern Singhroy; Victoria Tschirhart; Hernan Ugalde
- 14:00 - 1961 **Magnetic inversion modelling of the Skeleton Lake, a suspected impact structure (Muskoka, Ontario)**  
Mary Helen Armour, Joseph Boyce and Chandler Podhorodeski - McMaster University  
Ilya Inozemtsev - Marine Magnetics
- 14:15 - 1362 **2.5D Forward Modelling of Magnetic and Gravity Data in SW-Sudbury, ON: Geological Insights from Different Observation Levels**  
Austin Robert Davidson and Hernan Uglade - Brock University; Carol-Anne Genereux - Laurentian University
- 14:30 - 1352 **Informing 3D structural architecture in regions of excellent structural control – an example from the Leichhardt River Fault Trough, Queensland**  
Robin John Armit and Peter Betts - Monash University; Teagan Blaikie - CSIRO; Laurent Ailleres - Monash University
- 14:45 - 1316 **Integrated geophysical interpretation of the southwestern Athabasca Basin, Canada**  
Victoria Tschirhart - Geological Survey of Canada (GSC); Colin Card and Omid Mahmoodi - Saskatchewan Geological Survey; Dinu Pana - Alberta Geological Survey; Jeremy Powell - GSC
- 15:00 - 1145 **Preservation and Deformation of an ancient impact crater: The Sudbury Impact Structure**  
William A. Morris – McMaster University; Sara-Lise Underhay - Geosoft; Iris Lenauer and Hernan Ugalde - Paterson, Grant & Watson Limited

**THE EARTH I 15:30 - 17:00 ROOM 203**

- EA8: Resources in Paleozoic Orogenic Belts and Associated Sedimentary Basins: Challenges and Opportunities for Multidisciplinary Tectonics II**
- Organizers:** Sandra Barr, Acadia University; Cees van Staal, Geological Survey of Canada; John Waldron, University of Alberta; Chris White, Nova Scotia Government
- Chairs:** Sandra Barr; Gabriel Sombini dos Santos, Acadia University; Alison Thomas, University of Alberta; Chris White



15:30 - 1391	<b>Contrasting distribution of Sn-W-Ta and Au mineralization in the Appalachians and the Variscides</b> Rolf Ludwig Romer - GFZ German Research Centre for Geosciences; Uwe Kroner - TU Bergakademie Freiberg
15:45 - 1833	<b>The architecture of the Variscan orogen – structural control of late and postorogenic Sn/W deposits</b> Uwe Kroner - TU Bergakademie Freiberg; Tobias Stephan - TU Bergakademie Freiberg; Rolf L. Romer - Deutsches GeoForschungsZentrum GFZ
16:00 - 1742	<b>Sediment provenance control on the distribution of magmatic tin mineralization – the Paleozoic evolution of the peri-Gondwana shelf</b> Tobias Stephan and Uwe Kroner - TU Bergakademie Freiberg; Rolf L. Romer - GFZ Potsdam
16:15 - 1553	<b>New constraints on the ages of plutons, associated metamorphism, and regional tectonic context in the Bras d'Or terrane of Cape Breton Island, Nova Scotia</b> Deanne van Rooyen - Cape Breton University; Sandra Barr - Acadia University; Chris White - Nova Scotia Department of Natural Resources
16:30 - 1327	<b>Multidisciplinary investigation of primary and secondary salt welds in the late Paleozoic Antigonish sub-basin of Nova Scotia</b> Alison K. Thomas and John W.F. Waldron - University of Alberta
16:45 - 1024	<b>Impact of salt tectonism on stacking point bar reservoirs of the Lower Cretaceous Athabasca Oil Sands</b> Paul L. Broughton - Broughton and Associates
<b>THE EARTH II</b>	
<b>15:30 - 17:00</b>	
<b>ROOM 204</b>	
<b>EA22: Organizers:</b>	<b>Geochronology and Mineralogy of Crusts and their Ores using Emerging Techniques III</b> Tom Al, University of Ottawa; Fernando Corfu, University of Oslo; Christopher McFarlane, University of New Brunswick; Desmond Moser, University of Western Ontario; Jeanne Percival, Geological Survey of Canada
<b>Chairs:</b>	Tom Al; Desmond Moser; Jeanne Percival
15:30 - 1598	<b>Unambiguous in-situ pegmatite geochronology by LA-ICP-MS of apatite and wodginite</b> Chris McFarlane and Emily Palmer - University of New Brunswick; Alan Anderson - St Francis Xavier University
15:45 - 1993	<b>Portable infrared spectroscopy in the search for REE-bearing minerals: application to carbonatite and alkaline intrusion deposits</b> David Turner - University of British Columbia (UBC) and MineSense Technologies; Jeanne Percival and Katherine Venance - Geological Survey of Canada (GSC); Chris Sinclair – GSC and Carleton University; Benoit Rivard - University of Alberta; Lee Groat - UBC
16:00 - 1795	<b>Effects of Weathering on Leaching Properties of Slag from a Niobium mine, Oka, Quebec</b> Hannah Balkwill Tweedie and Tom Al - University of Ottawa Jeanne Percival and Alexandre Desbarats - Geological Survey of Canada
16:15 - 2426	<b>Zoning in minerals</b> Sytle Antao, Laura Cruickshank, Inayat Dhaliwal and Jeffrey Salvador - University of Calgary



**16:30 - 2069** **Air-borne spherules in metasedimentary rocks of the Rae cover sequence, Nunavut: tiny time capsules record ca. 2.1 Ga asteroid impact**  
 John Percival, Robert Berman and Bill Davis - Geological Survey of Canada (GSC); Mark Harrison - University of California, Los Angeles; Pat Hunt and Simon Jackson - GSC; Babak Shalchi - CANMET Materials, Natural Resources Canada; Katherine Venance - GSC

**16:45 - 1915** **Atomic worlds; 3D atomic configurations of geologic time in minerals from planetary crusts**  
 Desmond Moser and Gabriel Arcuri - University of Western Ontario; David Reinhard - CAMECA Instruments; Lee White - Royal Ontario Museum; James Darling - University of Portsmouth; Kimberly Tait - Royal Ontario Museum; Brian Langelier - McMaster University

**THE EARTH III**

**15:30 - 17:00**

**ROOM 205**

**EA17: Integrated Geosciences for Regional Geology: Geophysics, Remote Sensing and Field Mapping III**

**Organizers:** Peter Bobrowsky, Geological Survey of Canada (GSC); James Conliffe, Geological Survey of Newfoundland and Labrador; Vern Singhroy, Canada Centre for Mapping and Earth Observation; Victoria Tschirhart, GSC; Hernan Ugalde, Brock University

**Chairs:** Vern Singhroy; Victoria Tschirhart; Hernan Ugalde

**15:30 - 2050** **Urban deformation monitoring using InSAR**  
 Jan van Heiningen, Ryan Goldsburly and Ahmed Khwaja - 3vGeomatics

**15:45 - 2038** **Change detection monitoring with InSAR in the Thompson River valley, British Columbia, Canada**  
 David Huntley and Peter Bobrowsky - Geological Survey of Canada; Michael Hendry and Renato Macciotta - University of Alberta; Jeffrey Journault - BGC Engineering

**16:00 - 1306** **InSAR Deformation Monitoring of Coastal Infrastructure**  
 Vern Singhroy and Junhua Li - Canada Centre for Mapping and Earth Observation, Natural Resources Canada; Melanie Irvine - Geological Survey of Newfoundland and Labrador

**16:15 - 1851** **Salty stuff: integrating seismic, bathymetry, aeromagnetic, and field data to understand deformation in Bay St. George, southwest Newfoundland**  
 Morgan Snyder and John Waldron - University of Alberta

**16:30 - 1242** **Geophysics and geology: An essential combination illustrated by LITHOPROBE interpretations – Exploration examples**  
 Ronald Clowes - University of British Columbia



- EA30:** **Tectonics and Metallogeny of Cordilleran-Type Orogens: A Celebration of the Career of JoAnne Nelson I**
- Organizers:** Luke Beranek, Memorial University of Newfoundland (MUN); Maurice Colpron, Yukon Geological Survey; Steve Piercey, MUN
- Chairs:** Luke Beranek; Steve Piercey
- 
- 08:30 - 1579** **Correlation of outcrop mapped structures with fault patterns interpreted from remote sensing and geophysical data: Stikine, British Columbia**  
Iris Lenauer - University of Toronto; Hernan Ugalde - Brock University; William A. Morris - McMaster University; Bernd Milkereit - University of Toronto
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- 08:45 - 2006** **Spatial variations in lead isotopes: indicators of the tectonic and metallogenic history of Phanerozoic eastern Australia**  
David Huston - Geoscience Australia; David Champion - Geoscience Exploration; Peter Downes - Geological Survey of New South Wales; Gregg Morrison - Klondyke Exploration; Graham Carr - CSIRO; Roland Maas - University of Melbourne
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- 09:00 - 2158** **Lower Crust Detachment and Channel Flow in the North American Cordillera; The Crust Moves Independently of the Mantle**  
Roy D. Hyndman - Geological Survey of Canada
- 
- 09:15 - 1879** **Integrated provenance analysis of Jurassic-Cretaceous sedimentary strata of northern Siberia: implication for Mesozoic paleogeography and tectonics**  
Andrey Khudoley and Victoria Ershova - St. Petersburg State University; Andrey Prokopiiev - Diamond and Precious Metal Geology Institute SB RAS; Vladimir Verzhbitsky - Shirshov Institute of Oceanology RAS; Marianna Tuchkova - Geological Institute RAS
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- 09:30 - 1345** **Using detrital zircon to correlate and reconstruct early Paleozoic components of peri-Laurentian terranes in the northwestern Cordillera and Alaska**  
James V. Jones and Christopher Holm-Denoma - U.S. Geological Survey; Paul O'Sullivan - GeoSep Services
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- 09:45 - 1374** **Using Volcanogenic Massive Sulfides (VMS) as Proxies for Mid-Paleozoic Tectonics, Crustal Composition, and Basin Redox along the Ancient Pacific Margin of North America**  
Stephen John Piercey and Luke Beranek - Memorial University of Newfoundland

- EA33:** **Fault and Shear Zone Processes across Space and Time**
- Organizers:** James Kirkpatrick, McGill University; Kyle Larson, University of British Columbia; Kristin Morell, University of Victoria; Christie Rowe, McGill University
- Chair:** James Kirkpatrick
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- 08:30 - 1770** **The strength of the plate interface during subduction of an oceanic plateau: An example from the Leech River Shear Zone, Vancouver Island**  
Caroline Seyler, James Kirkpatrick and Dana Silerova - McGill University
- 
- 08:45 - 1959** **Mid-Cretaceous core complexes in the northern Cordillera of Yukon: deciphering their elusive boundaries**  
James J. Ryan, Alexandre Zagorevski and Nancy Joyce - Natural Resources Canada; Reid Staples - Douglas College; Daniel Gibson - Simon Fraser University
- 
- 09:00 - 2447** **A B-spline finite element material point method for modelling non-steady incompressible geological flow**  
Qihang Wu - University of Waterloo



- 09:15 - 2343 Polyphase deformation in the southwest Sudbury impact structure**  
 Carol-Anne Genereux and Bruno Lafrance - Laurentian University; Caroline A. Gordon - Ontario Geological Survey; Douglas K. Tinkham - Laurentian University
- 
- 09:30 - 1883 Structural control on geothermal activity in the eastern Mediterranean region: the Menderes Massif (Western Turkey)**  
 Vincent Marc Roche - ISTO; Laurent Jolivet - Sorbonne Université; Laurent Guillou-Frottier, Vincent Bouchot and Laurent Beccaletto - French Geological Survey
- 
- 09:45 - 1554 Seismic and outcrop investigation of fault development in the transtensional Moncton Subbasin at the McCully gas field, southern New Brunswick, Canada**  
 Jared C. Kugler and John Waldron - University of Alberta; Paul Durling - Geological Survey of Canada

**THE EARTH III 08:30 - 10:00 ROOM 205**

- EA6: Archean Evolution and Ore Deposit Models: Is Plate Tectonics the Key to the Past: A Session to Honour the Career of John Percival I. Sponsored by the Precambrian Division of the Geological Association of Canada**
- Organizers:** Shoufa Lin, University of Waterloo; Sally Pehrsson, Geological Survey of Canada; Chris Yakymchuk, University of Waterloo
- Chairs:** Sally Pehrsson; Chris Yakymchuk
- 
- 08:30 - 1888 KEYNOTE: There and back again; fluid history during descent of the gold-bearing Borden Lake Belt, Kapuskasing Uplift**  
 Desmond Moser - University of Western Ontario; John Bowman - University of Utah; John Valley - University of Wisconsin-Madison
- 
- 09:00 - 1274 The tectonometamorphic context of the north-west Opinaca, Superior Province, Eeyou Istchee Baie James**  
 Myriam Côté-Roberge and Carl Guilmette - Université Laval; Jean Goutier - Ministère de l'Énergie et des Ressources naturelles (MERN);  
 Lyal Harris - Institut national de la recherche scientifique (INRS); Matthijs Smit - University of British Columbia; Don Davis - University of Toronto; Nathan Cleven - Université Laval
- 
- 09:15 - 1270 Geodynamic origin of the Neoproterozoic Doré Lake Complex and the Chibougamau Greenstone Belt, Abitibi subprovince**  
 Ali Polat - University of Windsor; Robert Frei - University of Copenhagen; Fred Longstaffe - University of Western Ontario

**THE EARTH I 10:30 - 12:00 ROOM 203**

- EA30: Tectonics and Metallogeny of Cordilleran-Type Orogens: A Celebration of the Career of JoAnne Nelson II**
- Organizers:** Luke Beranek, Memorial University of Newfoundland (MUN); Maurice Colpron, Yukon Geological Survey; Steve Piercey, MUN
- Chairs:** Luke Beranek; Steve Piercey
- 
- 10:30 - 1317 Cordilleran mantle massifs of the Cache Creek terrane, British Columbia and Yukon, Canada – Evidence of oceanic extensional core complexes**  
 Adina Bogatu - Université du Québec à Montréal; Jean H. Bédard - Geological Survey of Canada (GSC); Loïc Labrousse - Sorbonne University; Alain Tremblay - Université du Québec à Montréal; Alex Zagorevski - GSC
- 
- 10:45 - 1199 The Bear Creek assemblage, southwest Yukon: Evidence for a Late Triassic ocean basin along the Insular-Intermontane terrane suture**  
 Joel Cubley - Yukon College; Steve Israel - Yukon Geological Survey



**11:00 - 1916** **Syncollisional Middle Jurassic volcanism along the northeastern margin of Stikinia, northwest BC**  
 Bram van Straaten, JoAnne Nelson, Rohanna Gibson and Sebastian Bichmaier - BC Geological Survey; Richard Friedman - University of British Columbia

**11:15 - 1162** **Early Jurassic collision-to-subduction transition between Whitehorse trough and Hazelton arc**  
 JoAnne Nelson - BC Geological Survey

**THE EARTH III 10:30 - 12:00 ROOM 205**

**EA6: Archean Evolution and Ore Deposit Models: Is Plate Tectonics the Key to the Past: A Session to Honour the Career of John Percival II. Sponsored by the Precambrian Division of the Geological Association of Canada**

**Organizers:** Shoufa Lin, University of Waterloo; Sally Pehrsson, Geological Survey of Canada; Chris Yakymchuk, University of Waterloo

**Chairs:** Sally Pehrsson; Chris Yakymchuk

**10:30 - 2001** **KEYNOTE: Can mineral deposit assemblages be used to infer tectonic settings in the Archean?**  
 David Huston, Michael Doublier and David Champion - Geoscience Australia

**11:00 - 2291** **Fingerprinting the interplay between, magmatism, deformation and partial melting within an Archean dome and keel structure: the Attic Complex (Canada)**  
 Nicolas Revelli, Jean David - Ministère de l'Énergie et des Ressources naturelles (MERN); Alain Tremblay - Université du Québec à Montréal; Félix Gervais - Polytechnique Montreal

**11:15 - 2096** **Transition from vertical to horizontal tectonism and gold mineralization in the Neoproterozoic**  
 Shoufa Lin - University of Waterloo

**THE EARTH LECTURES 11:30 - 12:00 ROOM 302**

**Mineralogical Association of Canada (MAC) Young Scientist Medalist Lecture: Hydrothermal properties of geologic fluids: Causes and consequences**  
 Matthew Steele-MacInnis, University of Alberta

**THE EARTH LECTURES 13:30-14:00 ROOM 302**

**Mineralogical Association of Canada (MAC) Peacock Lecture: Gifts of a Lifetime in Earth Science**  
 Stearns A. Morse, Prof. Emeritus, at University of Massachusetts

**THE EARTH I 13:30 - 15:00 ROOM 203**

**EA30: Tectonics and Metallogeny of Cordilleran-Type Orogens: A Celebration of the Career of JoAnne Nelson III**

**Organizers:** Luke Beranek, Memorial University of Newfoundland (MUN); Maurice Colpron, Yukon Geological Survey; Steve Piercey, MUN

**Chairs:** Luke Beranek; Steve Piercey

**14:00 - 2208** **Cretaceous magmatism in the Teslin Mountain & Lake Laberge area, Yukon**  
 Esther Bordet - Yukon Geological Survey

**14:15 - 2452** **A link between tectonic escape and Late Cretaceous porphyry mineralization in British Columbia**  
 Joel James Angen and Craig J.R. Hart - University of British Columbia

**14:30 - 1869** **Detrital zircon double-dating of forearc basin strata reveals upper plate response to changing subduction modes**  
 Eva Enkelmann - University of Calgary; Emily Finzel - University of Iowa

**14:45 - 1308** **Onset and Evolution of the Cordilleran Spread**  
 Luke Ootes - BC Geological Survey



**THE EARTH II****13:30 - 15:00****ROOM 204**

- EA7: Proterozoic Crustal Evolution and Metallogeny I. Sponsored by the Precambrian Division of the Geological Association of Canada**
- Organizers:** David Corrigan, Geological Survey of Canada; Jochen Kolb, Karlsruher Institut für Technologie; Raimo Lahtinen, Geological Survey of Finland
- Chairs:** David Corrigan; Raimo Lahtinen; Deanne Van Rooyen, Cape Breton University
- 
- 14:00 - 1155 KEYNOTE: Metallogeny and tectonic evolution of Fennoscandia at 2.0–1.8 Ga: the role of oroclinal**
- Raimo Lahtinen and Pasi Eilu - Geological Survey of Finland; Stephen Johnston - University of Alberta; Mohammad Sayab - Geological Survey of Finland
- 
- 14:30 - 1551 A new ultra-high temperature metamorphic domain in the Tasiuyak gneiss of the Torngat orogen, Canada**
- Deanne van Rooyen - Cape Breton University; David Corrigan - Geological Survey of Canada
- 
- 14:45 - 1860 Tectonic environment of formation of Proterozoic AMCG massifs: A case study from SE Laurentia**
- David Corrigan - Geological Survey of Canada

**THE EARTH III****13:30 - 15:00****ROOM 205**

- EA26: IGCP661 - The Critical Zone in Karst Systems (2017-2021)**
- Organizers:** Zhang Cheng, Karst Institute of Geology, Chinese Academy of Geological Sciences, International Research Center on Karst Under the Auspices of UNESCO; Chris Groves, Western Kentucky University; Martin Knez, Research Centre of the Slovenian Academy of Sciences and Arts, Karst Research Institute - University of Nova Gorica; Jiang Zhongcheng, Karst Institute of Geology
- Chairs:** Zhang Cheng; Jiang Zhongcheng
- 
- 14:00 - 1152 Current Status on Exploitation and Utilization of Karst Water Resources in Southwest China**
- Jianguo Pei - Karst Institute of Geology, Chinese Academy of Geological Sciences, International Research Center on Karst Under the Auspices of UNESCO
- 
- 14:15 - 1118 Diel variations of electrical conductivity and calcite precipitation in Chaotian River, Guilin, China**
- Cheng Zhang, Jinliang Wang and Qiong Xiao - Key Laboratory of Karst Dynamics, MLR/GZAR, Institute of Karst Geology, CAGS/International Research Center on Karst under the Auspices of UNESCO
- 
- 14:30 - 1110 Soil Leakage Features in Karst Peak Cluster Areas of Southwest China**
- Zhongcheng Jiang - Karst Institute of Geology
- 
- 14:45 - 1105 Changes of Carbon Sink Capacity of Underground Rivers Exposed in Karst Areas**
- Bing Bai - Karst Institute of Geology, Chinese Academy of Geological Sciences, International Research Center on Karst Under the Auspices of UNESCO

**THE EARTH IV****13:30 - 15:00****ROOM 202**

- EA14: Geomicrobiology - Driving Force in Earth History I**
- Organizers and Chairs:** Céline Michiels and Katharine Thompson, University of British Columbia





**14:15 - 2456 KEYNOTE: Looking forward: oxygen minimum zones as models for ocean deoxygenation in the anthropocene**  
 Alyse K. Hawley - University of British Columbia; Masaru Nobu - Bioproduction Research Institute; Connor Morgan-Lang and Monica Torres Beltran - University of British Columbia; Ramunas Stepanauskas - Bigeow Laboratories; Tanja Woyke - Joint Genome Institute; Steven Hallam - University of British Columbia

**14:45 - 2464 Microbial Communities in Coastal Shelf Sediments**  
 Jenifer Spence, Rachel Simister, Celine Michiels, Ashley Davidson, Niko Finke, Steven Hallam and Sean Crowe - University of British Columbia

**THE EARTH I 15:30 - 17:00 ROOM 203**

**Panel Discussion:** The Canadian Cordillera Array (CCArray), an Integrated Earth Systems Observatory  
**Principal** Dave Eaton, University of Calgary; Jeff Freymueller, University of Alaska Fairbanks  
**Organizers:**

**15:30 - 2428 The Canadian Cordillera Array is Coming Soon!**  
 Katherine Janet Elizabeth Boggs - Mount Royal University; Rick Aster - Colorado State University; Pascal Audet - University of Ottawa; Dave Eaton - University of Calgary; Julie Elliott - Purdue University; Jeff Freymueller - University of Alaska Fairbanks; Roy Hyndman and Thomas James - NRCan; Christie Rowe - McGill University; Malaika Ulmi - NRCan; Nicole West - Central Michigan University

*15:45 Panel Discussion:  
 As the US EarthScope program (2004–2018) draws to a close, the Canadian Cordillera Array (CCArray) is emerging as a bold initiative to install an Earth observation network spanning the Canadian Cordillera from the Beaufort Sea to the US Pacific northwest, with the goal of holistically examining entire Earth systems from the magnetosphere deep into the core. EarthScope’s mission statement outlined the vision of using North America as a natural laboratory to gain fundamental insight as to how the Earth operates, with the goal of enabling and encouraging scientists to study the Earth in creative new ways, allow innovative ideas to thrive, and ultimately provide new insights into the past, present, and future of the planet on which we live. This session welcomes presentations summarizing EarthScope results and possibilities for the CCArray, in addition to Critical Zone, Magnetosphere and other possible applications for this proposed integrated observing network.*

**THE EARTH II 15:30 - 17:00 ROOM 204**

**EA7: Proterozoic Crustal Evolution and Metallogeny II. Sponsored by the Precambrian Division of the Geological Association of Canada**

**Organizers:** David Corrigan, Geological Survey of Canada; Jochen Kolb, Karlsruher Institut für Technologie; Raimo Lahtinen, Geological Survey of Finland  
**Chairs:** David Corrigan; Raimo Lahtinen; Deanne Van Rooyen, Cape Breton University

**15:30 - 1949 KEYNOTE: A 1.9 to 1.84 Ga continent-scale high pressure terrane in the Churchill Province, Rae Craton, Canada: extent, timing and relationship to Nuna assembly**  
 Edith Martel - Northwest Territories Geological Survey; Sally Pehrsson, Robert Berman, Daniele Regis and William James Davis - Geological Survey of Canada (GSC); Eric Thiessen - Simon Fraser University; John Percival - GSC

**16:00 - 1984 Tectonic architecture and assembly of the WSW Rae craton, Athabasca region: a robust record of early-middle Paleoproterozoic crustal growth**  
 Kathryn Margaret Bethune - University of Regina; Kenneth Ashton - Saskatchewan Geological Survey; Michael Cloutier - University of Regina; Colin Card - Saskatchewan Geological Survey; Jordan Deane - University of Regina



- 16:15 - 1605 **1.9 Ga regional metamorphism in the southeastern Rae craton and 2.1 Ga Lu-Hf ages of mafic eclogites along the Snowbird Tectonic Zone**  
Eric Thiessen and Dan Gibson - Simon Fraser University; Daniele Regis and Sally Pehrsson - Geological Survey of Canada
- 
- 16:30 - 1955 **Structural-kinematic relations across the Nolan-Zemlak domain boundary, west-southwest Rae craton**  
Jordan Deane and Kathryn Bethune - University of Regina; Ken Ashton - Saskatchewan Geological Survey; Michael Cloutier - University of Regina
- 
- 16:45 - 2007 **New U-Pb and Lu-Hf results from Precambrian granitoids across the Nolan-Zemlak domain boundary: testing the Arrowsmith suture hypothesis**  
Michael Cloutier and Kathryn Bethune - University of Regina; Ken Ashton - Saskatchewan Geological Survey; Jordan Deane - University of Regina

**THE EARTH III** **15:30 - 17:00** **ROOM 205**

**EA25: Advances in Surficial, Environmental, and Geomorphic Hazard Characterization in the Anthropocene: Changing Climates, Changing Threats**  
**Organizer:** Sara Jenkins, University of British Columbia  
**Chair:** Catherine Hickson, Tuya Terra Geo Corp.

15:30 - 2409 **Ensuring Resource Transport Safety: Monitoring Critical Infrastructure with UAV Technology**  
Peter T. Bobrowsky, David Huntley and Roger MacLeod - Geological Survey of Canada; Olaf Niemann - University of Victoria; Michael Hendry and Renato Macciotta - University of Alberta

15:45 - 2398 **Transient response in morphology of mountain rivers to climate change**  
Santiago Cataño-Alvarez - National University Colombia & University of British Columbia; Andrew Wilcox - University of Montana; Jaime Ignacio Velez Upegui - Universidad Nacional

16:00 - 2281 **Phreatomagmatic eruptions: A proliferation of terms following the Mount Saint Helens USA, May 18th, 1980 eruption**  
Catherine Jean Hickson - Tuya Terra Geo Corp.

16:15 - 1846 **Understanding the sedimentary response in reservoirs to extreme events and infilling: case study of the Conowingo (Chesapeake Bay, USA) hydroelectric dam**  
Cindy Palinkas and Emily Russ - University of Maryland Center for Environmental Science



EA14: Organizers and Chairs:	<b>Geomicrobiology - Driving Force in Earth History II</b> Céline Michiels and Katharine Thompson, University of British Columbia
15:30 - 2160	<b>The biological origin to banded iron formation</b> Leslie James Robbins - University of Alberta; Stefan Lalonde - European Institute for Marine Studies; Daniel Alessi and Kurt Konhauser - University of Alberta
15:45 - 1907	<b>The role of cyanobacteria and dissolved organic carbon in marine trace metal cycling</b> Brendan Bishop, Salman Safarimohsenabad, Md. Samrat Alam, Leslie Robbins, Daniel Alessi and Kurt Konhauser - University of Alberta
16:00 - 1496	<b>Solubility of Sulfate and Chloride Green Rusts during Ageing and Transformation to Magnetite</b> Neil Lee MacPherson and Leslie Robbins - University of Alberta; Manual Schad, James Byrne and Andreas Kappler - University of Tübingen; Kurt Konhauser and Daniel Alessi - University of Alberta
16:15 - 2300	<b>Photoferrotrophy, banded iron formations, and the methane-rich Archean atmosphere</b> Katharine J. Thompson - University of British Columbia; Christopher T. Reinhard - Georgia Institute of Technology; Andreas Kappler - University of Tuebingen; Kurt O. Konhauser - University of Alberta; Sean A. Crowe - University of British Columbia
16:30 - 2363	<b>Photoferrotrophy as an arbiter of planetary climate</b> Chris Reinhard and Kazumi Ozaki - Georgia Institute of Technology



**THE EARTH I** **08:30 - 10:00** **ROOM 203**

<b>EA19:</b>	<b>Geophysical Exploration Methods I</b>
<b>Organizers:</b>	James Conliffe, Geological Survey of Newfoundland and Labrador; Ian Ferguson, University of Manitoba
<b>Chairs:</b>	Sarah Devriese, Condor Consulting; Ian Ferguson; Dominique Fournier, University of British Columbia
<b>08:30 - 1187</b>	<b>Use of Ambient Noise Surface Wave Tomography and Monitoring in Resource Exploration and Management</b> Dan Hollis - Sisprobe SAS
<b>08:45 - 1704</b>	<b>Three-dimensional inversion of the semi-airborne data collected over ancient antimony mine in eastern Germany</b> Maria Cherevatova, Michael Becken and Christian Nittinger - University of Muenster; Pritam Yogeshwar and Wiebke Moerbe - University of Cologne; Raphael Rochlitz - Leibniz Institute of Applied Geophysics; Hauke Petersen and Bernhard Siemon - Federal Institute for Geosciences and Natural Resources; Ronny Stolz and Markus Schiffler - Leibniz Institute of Photonic Technology; Matthew Comeau - University of Muenster
<b>09:00 - 1111</b>	<b>A new method for high density seismic imaging of shallow targets with near-zero environmental footprint</b> Allan Chatenay, Paul Thacker and Jesse Tigner - Explor
<b>09:15 - 1423</b>	<b>Airborne Electromagnetics (AEM) for Environmental Studies and Mine Operations</b> Bill Peter Brown - SkyTEM Canada Inc.; Flemming Effersø - SkyTEM Surveys ApS
<b>09:30 - 1071</b>	<b>Large depth exploration using pulsed radar electromagnetic technology</b> Gordon Stove - Adrok

**THE EARTH II** **08:30 - 10:00** **ROOM 204**

<b>EA7:</b>	<b>Proterozoic Crustal Evolution and Metallogeny III. Sponsored by the Precambrian Division of the Geological Association of Canada</b>
<b>Organizers:</b>	David Corrigan, Geological Survey of Canada; Jochen Kolb, Karlsruher Institut für Technologie; Raimo Lahtinen, Geological Survey of Finland
<b>Chairs:</b>	David Corrigan; Raimo Lahtinen; Deanne Van Rooyen, Cape Breton University
<b>08:30 - 1999</b>	<b>KEYNOTE: Tectonic and environmental controls on the secular metallogeny of Proterozoic Zn-Pb-Ag deposits</b> David Huston - Geoscience Australia; Sally Pehrsson - Geological Survey of Canada; Bruce Eglington - University of Saskatchewan
<b>09:00 - 1939</b>	<b>Metallogeny and its link to orogenic style during the Nuna supercontinent cycle</b> Sally Pehrsson - Geological Survey of Canada; Bruce Eglington - University of Saskatchewan; David Evans - Yale University; David Huston - Geoscience Australia; Steven Reddy - Curtin University
<b>09:15 - 1144</b>	<b>Understanding the thermal history of cratons: processes that affect cooling paths and data densities for regional studies</b> Anthony Reid - Geological Survey of South Australia; Stijn Glorie and Alan Collins - University of Adelaide; Marnie Forster - Australian National University
<b>09:30 - 2119</b>	<b>The role of brittle thrust faults in establishing the early crustal architecture of the Paleoproterozoic Flin Flon - Snow Lake belt of the southeastern Trans-Hudson Orogen</b> Kate Elizabeth Rubingh, Bruno Lafrance and Harold Gibson - Laurentian University
<b>09:45 - 1827</b>	<b>Lithogeochemistry, geochronology, and economic metal potential of pegmatites of the Hall Peninsula, Baffin Island, Nunavut</b> Alia Bigio, David Lentz and Chris McFarlane - University of New Brunswick



<b>THE EARTH III</b>		<b>08:30 - 10:00</b>	<b>ROOM 205</b>
<b>EA38:</b>	<b>Current Concepts in Igneous and Metamorphic Petrology and Related Processes I</b>		
<b>Organizers and Chairs:</b>	Sandra Barr, Acadia University; James Conliffe, Geological Survey of Newfoundland and Labrador; John Greenough, University of British Columbia; Deanne Van Rooyen, Cape Breton University		
<b>08:30 - 2442</b>	<b>The Lahaina Volcanics: &lt;0.6 Ma Rejuvenated stage volcanism on West Maui Volcano, Hawaii</b> Matt Trenkler and Brian Cousens - Carleton University		
<b>08:45 - 1985</b>	<b>Assembling the Hawaiian geochemical puzzle: insight from high-precision Pb isotopes from the Kaua'i shield</b> Nicole M.B. Williamson, Dominique Weis, James Scoates and Holly Pelletier - University of British Columbia		
<b>09:00 - 2368</b>	<b>Las Sierras-Masaya volcano, Nicaragua - A structurally dynamic yet chemically stable system</b> Jeffrey M. Zurek and Glyn Williams-Jones, Simon Fraser University; Séverine Mouné - Université Blaise Pascal		
<b>09:15 - 2176</b>	<b>Hornblende-veins in Iherzolite from the Canadian Cordilleran mantle lithosphere</b> Edward Ghent - University of Calgary; Ben Edwards - Dickinson College; Kelly Russell - University of British Columbia		
<b>09:30 - 1607</b>	<b>Discovery of young (post-1850 AD) lavas in south-central British Columbia, Canada: origin from coal fires or intraplate volcanism?</b> Dante Canil - University of Victoria; Mitch Mihalynuk - BC Geological Survey; Terri Lacourse - University of Victoria		
<b>09:45 - 1977</b>	<b>Isotopic and Trace Element Systematics of the Kiglapait Intrusion with Implications for Origin of the Nain Plutonic Suite, Labrador</b> Anais Fourny - Pacific Centre for Isotopic and Geochemical Research; James S. Scoates and Dominique Weis - University of British Columbia		
<b>THE EARTH I</b>		<b>10:30 - 12:00</b>	<b>ROOM 203</b>
<b>EA19:</b>	<b>Geophysical Exploration Methods II</b>		
<b>Organizers:</b>	James Conliffe, Geological Survey of Newfoundland and Labrador; Ian Ferguson, University of Manitoba		
<b>Chairs:</b>	Sarah Devriese, Condor Consulting; Ian Ferguson; Dominique Fournier, University of British Columbia		
<b>10:30 - 2108</b>	<b>SimPEG: open source software for simulations and inversions in geophysics</b> Lindsey Heagy - University of British Columbia; Rowan Cockett - Sequent; Seogi Kang and Dominique Fournier - University of British Columbia		
<b>10:45 - 2098</b>	<b>Make the most of your knowledge: Using machine learning to make geophysical inversions geologic</b> Thibaut Astic and Douglas Oldenburg - University of British Columbia		
<b>11:00 - 1863</b>	<b>OreVision® IP – Lessons Learned in Induced Polarization</b> Chris Nind, Pam Coles and Pierre Berube - Abitibi Geophysics		
<b>11:15 - 1740</b>	<b>The separation technique of disturbances for diurnal variation correction in marine magnetic survey on disturbed day</b> Xingchen Pan, Changli Yao and Yuanman Zheng - China University of Geosciences		



11:30 - 2266 **Hybrid Domain Full Waveform Inversion with Structure-oriented Filter**  
 Weisheng Hou - School of Earth Sciences and Engineering, Guangdong Provincial Key Lab of Geodynamics and Geohazards, Sun Yat-sen University; Chanjie Cui - Sun Yat-sen University

**THE EARTH II** **10:30 - 12:00** **ROOM 204**

EA4: **Contaminants in the Natural Environment**  
 Organizer  
 and Chair: Stephen Morison, Geological Association of Canada

10:30 - 1689 **Application of Isotope Geochemistry to Source and Quantify Anthropogenic Impacts on Pacific Salmon Populations**  
 Miling Li, Dominique Weis, Marghalera Amini, Brian Hunt, Wade Smith and Evgeny Pakhomov - University of British Columbia

10:45 - 1283 **Pb isotope and trace element analyses of honey and fish tissue: bioindicators for environmental assessment in a changing world**  
 Kate Smith, Dominique Weis, Miling Li, Marghalera Amini, Lai Vivian and Kathy Gordon - University of British Columbia

11:00 - 1998 **Reaction Pathways of Mo Isotopes and the Applicability of Mo as Redox Proxy Tool in Saanich Inlet, British Columbia**  
 Elizabeth King - University of British Columbia

11:15 - 1989 **Northwest Hawaiian Ridge Ferromanganese Crust Pb Isotopes Characterize the Anthropogenic Pb Flux in the Central Pacific Ocean Over Time**  
 Lauren N. Harrison and Dominique Weis - Pacific Centre for Isotopic and Geochemical Research

11:30 - 2094 **In situ observation of metal speciation in soil with the use of real-time X-ray imaging**  
 Réjean Girard and Jonathan Tremblay - IOS Services Géoscientifiques Inc.

11:45 - 1880 **Can "fiberbanks" be capped?**  
 Alizee Pauline Lehoux - Uppsala University; Joseph Jersak - SAOEC; Anna Apler - SGU; Ian Snowball - Uppsala University

12:00 - 2476 **Potential ecological and human health risks associated with abandoned goldmine tailings contaminated soil in the Murchison Area (Limpopo Province), South Africa**  
 Lawrence Diko Makia, Itumeleng Mabebele and Napoleon Hammond - University of Limpopo

**THE EARTH III** **10:30 - 12:00** **ROOM 205**

EA38: **Current Concepts in Igneous and Metamorphic Petrology and Related Processes II**  
 Organizers  
 and Chairs: Sandra Barr, Acadia University; James Conliffe, Geological Survey of Newfoundland and Labrador; John Greenough, University of British Columbia; Deanne Van Rooyen, Cape Breton University

10:30 - 1666 **KEYNOTE: Primitive mafic continents suppressed the early oxygen cycle**  
 Matthijs Smit - University of British Columbia; Klaus Mezger - Universität Bern

11:00 - 2003 **The dramatic influence of Large Igneous Provinces on rapid climatic change**  
 Richard Ernst - Carleton University; Nasrddine Youbi - Cadi Ayyad University, Marrakesh



- 11:15 - 1626 **Geochemistry of the Hansen Point Volcanic Complex, Nunavut, Canada: a possible analogue of the Alpha-Mendelev Ridge on Ellesmere Island**  
Tiera Venesse Naber - University of Calgary; Stephen Grasby – Geological Survey of Canada; Christian Tegner - Aarhus University; Jennifer Cuthbertson - University of Calgary
- 
- 11:30 - 2082 **Assessing the Link Between the Skaergaard Intrusion and East Greenland Flood Basalts from In Situ LA-ICP-MS Lead Isotope Geochemistry of Plagioclase**  
June Cho, James Scoates, Dominique Weis and Marghaleray Amini - University of British Columbia
- 
- 11:45 - 1454 **The Control of Pyrrhotite on the Fe Isotope Composition of Magmatic Systems: Implications for the Formation of Ni-Cu Deposits and Layered Intrusions**  
Laura Bilenker, Dominique Weis, James Scoates and Eden Perry - University of British Columbia
- 
- 12:00 - 2091 **A comparative study of glaciovolcanic palagonitization of tholeiitic and alkaline sideromelane at Helgafell, Iceland and Wells Gray, BC, Canada**  
Erica Massey and John Greenough - University of British Columbia; Benjamin Edwards - Dickinson College

**THE EARTH IV** **10:30 - 12:00** **ROOM 202**

- EA24: Quaternary Paleoenvironments**  
**Organizer and Chair:** David Huntley, Geological Survey of Canada
- 
- 10:30 - 2233 **Glaciovolcanism in the Canadian Cascade volcanic arc: a powerful proxy for ancient ice**  
Alexander Micheal Wilson and James Kelly Russell - University of British Columbia
- 
- 10:45 - 2037 **Noise-Induced Cycle Suppression: A New Mechanism for the Late Quaternary Climate Response at 100 kyr**  
Ivan L'Heureux - University of Ottawa
- 
- 11:00 - 1576 **Reconstructing Eastern Beringian Paleoenvironment and Ecological Niche of late Pleistocene *Ovibos moschatus* using SIBER**  
Stephanie Mabee, Fred Longstaffe and Elizabeth Webb - University of Western Ontario; Grant Zazula – Government of Yukon
- 
- 11:15 - 1443 **Variations in Nd isotopic composition recorded in equatorial Atlantic sediments during the glacial/interglacial climatic cycles of the Pleistocene**  
Genna M. Patton, Roger Francois and Dominique Weis - University of British Columbia

**THE EARTH I** **13:30 - 15:00** **ROOM 203**

- EA18: Geophysical Constraints on Lithospheric Structures and Processes I**  
**Organizers:** James Conliffe, Geological Survey of Newfoundland and Labrador; Phil McCausland, University of Western Ontario  
**Chairs:** Irina Artemieva, University of Copenhagen; Nathan Hayward, Geological Survey of Canada; Phil McCausland; Hans Thybo, University of Oslo
- 
- 13:30 - 1786 **Mineralization of the South Hangai Fault Zone and the Bayankhongor Ophiolite Belt, west-central Mongolia, imaged with electrical resistivity models**  
Matthew Joseph Comeau and Michael Becken - University of Muenster; Johannes Kaeuff and Alexey Kuvshinov - ETH-Zurich; Sodnomsambuu Demberel - Mongolian Academy of Sciences



13:45 - 2304	<b>Geodynamics of the West Siberian Basin: traps, rifts, hydrocarbons</b> Irina Artemieva - University of Copenhagen; Yulia Cherepanova - Wardell Armstrong International; Hans Thybo - International Lithosphere Program
14:00 - 1320	<b>Borehole Magnetic surveys in weakly magnetic sediments (Chixculub impact crater) versus strongly magnetic volcanics (Bathurst Mining Camp)</b> William A. Morris - McMaster University; Sara-Lise Underhay - Paterson, Grant & Watson Limited; Hernan Ugalde - Brock University; Bernd Milkereit - University of Toronto
14:15 - 1232	<b>Magnetic anomaly constrained inversions and magnetic petrophysics: susceptibility, remanence and viscous</b> William A. Morris - McMaster University; Hernan Ugalde - Brock University; Randy Enkin - Geological Survey of Canada; Marc Vallee - Memorial University of Newfoundland
14:30 - 1169	<b>S-wave velocity structure of Cameroon (West Africa) from joint inversion of receiver function, Rayleigh wave dispersion and ellipticity measurements</b> Adebayo Oluwaseun Ojo - University of Science and Technology of China; Sidao Ni and Jun Xie - Chinese Academy of Sciences

**THE EARTH II 13:30 - 15:00 ROOM 204**

EA27:	<b>Proterozoic Sedimentary Basins: The Bigger Picture of a Formative Eon I. Sponsored by the Precambrian Division of the Geological Association of Canada</b>
Organizers:	Camille Partin, University of Saskatchewan; Robert Rainbird, Geological Survey of Canada
Chair:	Camille Partin
13:30 - 1899	<b>KEYNOTE: Proterozoic iron formation and phosphorite: biogeochemical cycling of Fe and P during a complex eon</b> Peir Pufahl - Acadia University
14:00 - 2065	<b>Forged in a fireball: ca. 2.1 Ga impact spherules in the Rae cover sequence, Canada</b> John Percival - Geological Survey of Canada (GSC); Andrey Bekker - University of California, Riverside; Bill Davis - GSC; Mike Hamilton and Jack Satterly - University of Toronto; Mark Harrison - University of California, Los Angeles
14:15 - 1861	<b>Lithochemical classification of clastic sedimentary rocks using a quartz-feldspar-mica ternary diagram: Examples and applications</b> Clifford Read Stanley - Acadia University
14:30 - 1731	<b>A uniformitarian outlook on Proterozoic rivers, based on comparisons with modern systems</b> Alessandro Ielpi - Laurentian University
14:45 - 2227	<b>Depositional History and Provenance of Proterozoic Kaladgi and Bhima Sub-Basins in Southern India: A Multipronged Geochronology Approach</b> Sojen Joy - De Beers Group Services; Sarbani Patranabis-Deb and Dilip Saha - Indian Statistical Institute; Hielke Jelsma - Anglo American; Roland Maas - University of Melbourne; Ulf Söderlund - Lund University; Sebastian Tappe - University of Johannesburg; Gert van der Linde - De Beers Group Services

**THE EARTH III 13:30 - 15:00 ROOM 205**

EA38:	<b>Current Concepts in Igneous and Metamorphic Petrology and Related Processes III</b>
Organizers and Chairs:	Sandra Barr, Acadia University; James Conliffe, Geological Survey of Newfoundland and Labrador; John Greenough, University of British Columbia; Deanne Van Rooyen, Cape Breton University





- 13:30 - 2157 **KEYNOTE: Origin of Regional High Temperature Barrovian Metamorphism; The Heat of Orogeny**  
Roy D. Hyndman - Geological Survey of Canada
- 
- 14:00 - 1864 **A study of the P-T-X-time evolution of the porphyry-style Au-Cu-Mo-PGE mineralized systems of the Kassiteres-Leptokaria intrusive complex, NE Greece**  
Rebecca Perkins, Frances J. Cooper, Brian Tattitch and Byron Adams - University of Bristol; Matthijs C. van Soest - Arizona State University; Daniel Condon and Jonathan Naden - British Geological Survey
- 
- 14:15 - 1781 **P-T-t paths across the New Quebec Orogen and relationships to tectonics**  
Antoine Godet; Carl Guilmette - Université Laval; Loïc Labrousse - Sorbonne Université; Matthijs Smit - University of British Columbia; Don Davis - University of Toronto; Tom Raimondo - University of South Australia; Benoit Caron - Sorbonne Université
- 
- 14:30 - 1448 **KEYNOTE: Ore-element depth profiles through the Abitibi lithospheric mantle**  
Christopher Lawley, Bruce Kjarsgaard, Simon Jackson, Zhaoping Yang and Duane Petts - Natural Resources Canada; Eric Roots - Laurentian University

**THE EARTH IV 13:30 - 15:00 ROOM 202**

- EA1: Convergent Margin Geohazards and Geodisasters: Present Understanding, Mitigation, and Long and Short Term Preparedness I**  
**Organizers:** Yildirim Dilek, Miami University; Yujiro Ogawa, University of Tsukuba  
**Chairs:** Yildirim Dilek; Kiichiro Kawamura, Yamaguchi University; Yujiro Ogawa; Yasukuni Okubo, Japan Space Systems
- 
- 13:30 - 1035 **Growing vulnerability with a rapid civilization, A case of “International active faults” extending in Myanmar, Laos, Thailand and China**  
Yasukuni Okubo - Japan Space Systems; Yutaka Takahashi - Geological Survey of Japan; Masaru Fujita - Japan Space System; Adichat Surinkum - CCOP Technical Secretariat; Wongsomsak Sompob - Department Mineral Resources; Yoshiki Ninomiya - Geological Survey of Japan
- 
- 13:45 - 1382 **KEYNOTE: Integrated approach to earthquake hazard mitigation: Initiatives in India**  
Brijesh Kumar Bansal, Mithila Verma and Ajeet Pandey - Ministry of Earth Sciences
- 
- 14:15 - 2265 **Geohazards and geodisasters of the 1923 Great Kanto Earthquake: New evidence from aerial photographs and witnesses**  
Yasumitsu Kanie and Yuki Kanie - Geo-Kanagawa
- 
- 14:30 - 2247 **Great Kanto Earthquake (M 7.9, 1923) and related tectonics revisited from land and submarine**  
Yujiro Ogawa - University of Tsukuba; Shin'ichi Mori
- 
- 14:45 - 1241 **How to mitigate the coming natural disasters from geological sciences: Discussion on important aspects from scientists to society**  
Yujiro Ogawa - University of Tsukuba; Yildirim Dilek - Miami University

**THE EARTH I 15:30 - 17:00 ROOM 203**

- EA18: Geophysical Constraints on Lithospheric Structures and Processes II**  
**Organizers:** James Conliffe, Geological Survey of Newfoundland and Labrador; Phil McCausland, University of Western Ontario  
**Chairs:** Irina Artemieva, University of Copenhagen; Nathan Hayward, Geological Survey of Canada; Phil McCausland; Hans Thybo, University of Oslo



15:30 - 2468 **Magmatic underplating and continental rifting**  
 Hans Thybo - Istanbul Technical University; Irina Artemieva - University of Copenhagen

15:45 - 2303 **Density structure of the cratonic mantle, kimberlite distribution and diamond exploration**  
 Irina Artemieva - University of Copenhagen

16:00 - 1931 **Magnetotelluric imaging of Hudson Bay Basin beneath the Kaskattama Highlands, northeastern Manitoba, and underlying Precambrian terranes**  
 Ian Ferguson, Joe McLeod, Neil Clark and Taras Zaporozan - University of Manitoba; Jim Craven and Brian Roberts - Geological Survey of Canada; Tyler Hodder and Michelle Nicolas - Manitoba Geological Survey

16:15 - 1357 **Using heat flow and magnetotellurics to constrain an obscured lithospheric interface: The Gawler Craton-Musgrave Province boundary, central Australia**  
 Alicia Pollett - University of South Australia; Stephan Thiel - Geological Survey of South Australia; Betina Bendall - Energy Resources Division, South Australian Department of Premier and Cabinet; Tom Raimondo - University of South Australia; Martin Hand - University of Adelaide

**THE EARTH II 15:30 - 17:00 ROOM 204**

EA27: **Proterozoic Sedimentary Basins: The Bigger Picture of a Formative Eon II. Sponsored by the Precambrian Division of the Geological Association of Canada**  
 Organizers: Camille Partin, University of Saskatchewan; Robert Rainbird, Geological Survey of Canada  
 Chair: Camille Partin

15:30 - 1828 **Stratigraphy and depositional environment of the Paleoproterozoic Karrat Group, West Greenland**  
 Camille A. Partin - University of Saskatchewan

15:45 - 1754 **Sedimentology, stratigraphy, and stable-isotope geochemistry of the Palaeoproterozoic Kimerot Group, Kilohigok basin (Nunavut, Arctic Canada)**  
 Sophie Michel, Alessandro Ielpi and Elizabeth Turner - Laurentian University

16:00 - 1729 **Sedimentology and stratigraphy of the Husky Creek Formation, Nunavut, Canada**  
 Robert David Meek and Alessandro Ielpi - Laurentian University  
 Rob Rainbird - Geological Survey of Canada

**THE EARTH III 15:30 - 17:00 ROOM 205**

EA38: **Current Concepts in Igneous and Metamorphic Petrology and Related Processes IV**  
 Organizers and Chairs: Sandra Barr, Acadia University; James Conliffe, Geological Survey of Newfoundland and Labrador; John Greenough, University of British Columbia; Deanne Van Rooyen, Cape Breton University

15:30 - 1540 **Corundum – tracing subduction melting**  
 Roland Oberhaensli - International Union of Geological Sciences (IUGS); Osman Candan - Dokuz Eylül University; Erik Duesterhoeft and Romain Bousquet - Kiel University

15:45 - 2010 **In Situ Analysis of Crystallized Melt Inclusions in Quartz Phenoclasts from Porphyritic Intrusions in the Yellowknife Greenstone Belt, NWT**  
 Sarah Speight, David Lentz and Chris McFarlane - University of New Brunswick

16:00 - 2218 **Mineralogy and Chemistry of Precious Metals and Sulphides from the Bowdens Epithermal Silver Deposit, Eastern New South Wales, Australia**  
 Angela Lay, Ian T. Graham and Karen Privat - University of New South Wales; Scott Munro - Bowdens Silver Ltd.



- 16:15 - 1486 **Columbite-(Mn) crystallization from hydrothermal fluid - melt interactions**  
 Alysha G. McNeil, Robert L. Linnen and Roberta L. Flemming - Western University  
 Mostafa Fayek - University of Manitoba
- 
- 16:30 - 1591 **High P-T phase equilibria of the calcite + quartz + H<sub>2</sub>O system: An in situ micro-Raman spectroscopy and microscopic observations study**  
 Robert Mayanovic - Missouri State University  
 Xueyin Yuan - Chinese Academy of Geological Sciences
- 
- 16:45 - 2425 **High Pressure Cu-Fe-S Phase Equilibria: Some experimental and thermodynamic constraints on sulfides in subduction zones and the lithospheric mantle**  
 Julie L. Brown - Canadian Nuclear Safety Commission; Sabastien C. Dyer - University of Toronto; James E. Mungall - Carleton University; David J. Ellis - Australian National University; Andrew G. Christy - University of Queensland

**THE EARTH IV** **15:30 - 17:00** **ROOM 202**

- EAT:** **Convergent Margin Geohazards and Geodisasters: Present Understanding, Mitigation, and Long and Short Term Preparedness II**
- Organizers:** Yildirim Dilek, Miami University; Yujiro Ogawa, University of Tsukuba
- Chairs:** Yildirim Dilek; Kiichiro Kawamura, Yamaguchi University; Yujiro Ogawa; Yasukuni Okubo, Japan Space Systems
- 
- 15:30 - 2115 **KEYNOTE: Geohazards and Their Impact on World Geopolitics**  
 Yildirim Dilek - Miami University
- 
- 16:00 - 1617 **Microplastics: diffusion into ocean floors and methodology for age determination**  
 Kiichiro Kawamura - Yamaguchi University
- 
- 16:15 - 1473 **The Lava Lake Laboratory, Masaya volcano, Nicaragua – A new approach to Extreme Science**  
 Glyn Williams-Jones - Simon Fraser University; Dustin Johnston-Jewell, Guillermo Caravantes, Max Dugal and Miko McGovern - GeoArc Foundation; Séverine Moune and Pierre-Jean Gauthier - Laboratoire Magmas et Volcans; Jeffrey Witter - Simon Fraser University and International Volcano Monitoring Fund; The GEOARC Team - GeoArc Foundation
- 
- 16:30 - 2252 **KEYNOTE: The WAVES Consortium: An Integrated Approach to Earthquake and Tsunami Risk Assessment, Communication and Reduction in Indonesia**  
 Ron Harris - Brigham Young University; Carolus Prasetyadi - Universitas Pembangunan Nasional; Jared Whitehead - Brigham Young University; Eko Yulianto, Purna Putra and Irina Raffliana - Indonesian Institute of Science; Hanif Ibadurrahman - Brigham Young University



<b>THE EARTH I</b>		<b>08:30 - 10:00</b>	<b>ROOM 203</b>
<b>EA9:</b>	<b>From Continental Shelf to Slope - Mapping the Oceanic Realm I</b>		
<b>Organizers and Chairs:</b>	Kristine Asch, Federal Institute for Geosciences and Natural Resources; Hiroshi Kitazato, Tokyo University of Marine Science and Technology; Henry Vallius, Geological Survey of Finland		
<b>08:30 - 1608</b>	<b>Coastal mapping towards establishment of Ecosystem-based Disaster Risk Reduction (Eco-DRR)</b> Hiroshi Kitazato - Tokyo University of Marine Science and Technology		
<b>08:45 - 1518</b>	<b>Impact of huge earthquake and tsunami on sea floor environments: Importance of surface sediment dataset to evaluate the disturbances</b> Ken Ikehara - Geological Survey of Japan, AIST		
<b>09:00 - 1414</b>	<b>Seafloor environment around the coastal area after the 2011 off the pacific coast of Tohoku Earthquake</b> Takafumi Kasaya - Japan Agency for Marine–Earth Science and Technology; Izumi Sakamoto and Yuka Yokoyama - Tokai University		
<b>09:15 - 1153</b>	<b>Geological maps around the Okinawa-jima Island -to clarify the stratigraphy, tectonics and the Quaternary paleoenvironmental changes</b> Kohsaku Arai, Takuya Itaki and Hirokuni Oda - Geological Survey of Japan, AIST		
<b>09:30 - 1838</b>	<b>A marine genetic classification and mapping approach for seafloor features in the Australian Exclusive Economic Zone</b> Kim Picard, Scott Nichol, Zhi Huang, Jodie Smith, Alix Post and Adam Lewis - Geoscience Australia		

<b>THE EARTH II</b>		<b>08:30 - 10:00</b>	<b>ROOM 204</b>
<b>EA39:</b>	<b>In Memory of Kurt Kyser: Snapshots of Studies to Emphasize the Application of Isotope Geochemistry and Mineralogy to Earth Processes I. Sponsored by the Precambrian Division of the Geological Association of Canada</b>		
<b>Organizers:</b>	Kevin Ansdell, University of Saskatchewan; Mostafa Fayek, University of Manitoba		
<b>Chairs:</b>	Kevin Ansdell; Mostafa Fayek; Adrienne Hanly, International Atomic Energy Agency		
<b>08:30 - 1564</b>	<b>KEYNOTE: The Oxygen and Hydrogen Isotopes of Clay Minerals</b> Fred John Longstaffe - University of Western Ontario		
<b>09:00 - 2103</b>	<b>Unravelling the paleohydrogeology the Williston Basin using stable isotopes of formation waters: Kurt Kyser led the way</b> Ben Rostron - University of Alberta		
<b>09:15 - 2025</b>	<b>From Formation to Exploration: Kurt Kyser's Contributions to Fluid Flow in Proterozoic Sedimentary Basins</b> Steve R. Beyer - Queen's University; Eric Hiatt - University of Wisconsin, Oshkosh; Lawrence Lahusen - UraVan Minerals Inc.; Paul Polito - Independence Group NL; Garth Drever - Frontier Lithium; James Marlatt - GeoTotal Group Ltd.		
<b>09:30 - 2166</b>	<b>Orogenic gold deposits in the Reindeer Zone of the Paleoproterozoic Trans-Hudson Orogen</b> Kevin Ansdell - University of Saskatchewan		



<b>THE EARTH III</b>		<b>08:30 - 10:00</b>	<b>ROOM 205</b>
<b>EA11:</b>	<b>Supercontinent Cyclicity with a Focus on Contributions from Circum-Pacific Regions I</b>		
<b>Organizers:</b>	Bruce Eglington, University of Saskatchewan; Dave Evans, Yale University; Zheng-Xiang Li, Curtin University		
<b>Chairs:</b>	Bruce Eglington; Zheng-Xiang Li		
<b>08:30 - 1244</b>	<b>Decoding Earth's rhythms: Modulation of supercontinent cycles by longer superocean cycles</b>		
	Zheng-Xiang Li, Ross Mitchell and Christopher Spencer - Curtin University; Richard Ernst - Carleton University and Tomsk State University; Sergei Pisarevsky and Uwe Kirscher - Curtin University; Brendan Murphy - St. Francis Xavier University and Curtin University		
<b>08:45 - 1638</b>	<b>Tectono-magmatic evolution of the Southern Neo-Tethys in relation with ophiolites and mineral deposits: Database development and plate reconstructions</b>		
	Khalil Allahyari, Kevin Ansdell and Bruce Eglington - University of Saskatchewan		
<b>09:00 - 2048</b>	<b>Semi-automatic Identification of Unconformities for GIS Geological Maps</b>		
	Hoang Anh Tu Nguyen and Bruce Eglington - University of Saskatchewan		
<b>09:15 - 1719</b>	<b>Evolution of Late Mesozoic granitoids in NE Asia: evidence for early-stage low-angle subduction and late-stage roll-back of Paleo-Pacific Plate</b>		
	Tao Wang, Jianjun Zhang, Lei Zhang, Shan Li, Lei Guo and Ying Tong - Chinese Academy of Geological Sciences		
<b>THE EARTH I</b>		<b>10:30 - 12:00</b>	<b>ROOM 203</b>
<b>EA9:</b>	<b>From Continental Shelf to Slope - Mapping the Oceanic Realm II</b>		
<b>Organizers and Chairs:</b>	Kristine Asch, Federal Institute for Geosciences and Natural Resources; Hiroshi Kitazato, Tokyo University of Marine Science and Technology; Henry Vallius, Geological Survey of Finland		
<b>10:30 - 1825</b>	<b>International and national collaboration to maximise and standardise Australian seabed mapping efforts</b>		
	Kim Picard, Tanya Whiteway and Rachel Nanson - Geoscience Australia; Vanessa Lucieer - University of Tasmania; Rachel Pzreslawski, Scott Nichol, Jodie Smith, Alix Post and Zhi Huang - Geoscience Australia; Janine Guinan - Geological Survey Ireland; Adam Lewis - Geoscience Australia		
<b>10:45 - 1142</b>	<b>Discover Europe's seabed geology - The EMODnet concept of uniform collection and harmonization of marine data</b>		
	Henry Vallius - Geological Survey of Finland		
<b>11:00 - 1777</b>	<b>EMODNET Sea Floor Geology: Integrating Europe's Marine Geology Across EEZ-Boundaries</b>		
	Kristine Charlotte Asch - Federal Institute for Geosciences and Natural Resources		
<b>11:15 - 1120</b>	<b>EMODnet Geology translating seabed data into informative marine mineral maps</b>		
	Maria Judge, Koen Verbruggen and Charise McKeon - Geological Survey Ireland		
<b>11:30 - 1218</b>	<b>Revealing the secrets of Norway's seafloor</b>		
	Reidulv Bøe, LiljaRun Bjarnadóttir and Sigrid Elvenes - Geological Survey of Norway		
<b>11:45 - 1510</b>	<b>Active Transcurrent Faulting within the Cascadia Upper Plate that Extends Across the US (Washington)–Canada International Border</b>		
	H. Gary Greene - Moss Landing Marine Labs; Vaughn Barrie and Brian Todd - Geological Survey of Canada		



**THE EARTH II** **10:30 - 12:00** **ROOM 204**

- EA39: **In Memory of Kurt Kyser: Snapshots of Studies to Emphasize the Application of Isotope Geochemistry and Mineralogy to Earth Processes II.** Sponsored by the Precambrian Division of the Geological Association of Canada
- Organizers:** Kevin Ansdell, University of Saskatchewan; Mostafa Fayek, University of Manitoba  
**Chairs:** Kevin Ansdell; Mostafa Fayek; Adrienne Hanly, International Atomic Energy Agency
- 
- 10:30 - 1820 **KEYNOTE: The Structure Hierarchy Principle and Silicate Minerals**  
 Frank C. Hawthorne - University of Manitoba
- 
- 11:00 - 2405 **Biochemical siderite, phosphate, and hematite, and glaciomarine sedimentation during the waning Marinoan ice age: Jacadigo Basin, Corumba, Brazil**  
 Eric Hiatt - University of Wisconsin; Peir Pufahl - Acadia University; Leandro Silva - Queen's University
- 
- 11:15 - 2182 **An evolutionary history of the Central Asian Orogenic Belt from subduction of external ocean to internal ocean – Nd isotopic evidence?**  
 Min Sun - University of Hong Kong; Yang Yu - Chinese Academy of Sciences; Karel Schulmann - Université de Strasbourg
- 
- 11:30 - 1132 **KEYNOTE: Geochemical solutions for urban society: London, England as a case study**  
 John Ludden - British Geological Survey

**THE EARTH III** **10:30 - 12:00** **ROOM 205**

- EA11: **Supercontinent Cyclicality with a Focus on Contributions from Circum-Pacific Regions II**
- Organizers:** Bruce Eglington, University of Saskatchewan; Dave Evans, Yale University; Zheng-Xiang Li, Curtin University  
**Chairs:** Bruce Eglington; Zheng-Xiang Li
- 
- 10:30 - 2044 **Geodynamic development of the South China block from Precambrian to Cretaceous: constraints from geochemistry, geochronology and geology**  
 Yuxin Mao and Bruce Eglington - University of Saskatchewan
- 
- 10:45 - 1560 **Terra Borealis, the Great Northern Supercontinent: A link between Columbia and Rodinia**  
 Christopher Robert Scotese - PALEOMAP Project; Reece Elling - Northwestern University
- 
- 11:00 - 1404 **Using Detrital Zircon Data to Examine Palaeogeographic and Geodynamic Settings of Laurentia: The Advantage of Data Mining**  
 Dean Meek and Bruce Eglington - University of Saskatchewan
- 
- 11:15 - 2167 **Bonnetia and its role in the late Paleoproterozoic history of western Laurentia**  
 Derek Thorkelson - Simon Fraser University
- 
- 11:30 - 2099 **Linkages between Laurentia and Australia; the possible role of various Asian blocks**  
 Bruce Melville Eglington - University of Saskatchewan; David Evans - Yale University; Sally Pehrsson - Geological Survey of Canada; Colton Vessey - University of Saskatchewan; Bin Wen - Yale University; Dean Meek and Yuxin Mao – University of Saskatchewan

**THE EARTH I**

**13:30 - 15:00**

**ROOM 203**

**Panel Discussion: MARISCOPE – NCE Town Hall Meeting: Mobilization of Canada’s Marine Geoscience Community for the Development of a Network of Centres of Excellence Focused on Studies of the Canadian Ocean Floor**

**Organizers:** Michael Bostock, University of British Columbia; John Jamieson, Memorial University of Newfoundland; Mladen Nedimovic, Dalhousie University  
*The Atlantic, Pacific and Arctic Oceans are of key importance, not only to Canada’s economy, but also to Canada’s environment, culture, public health, and society. Scientific study of the ocean provides the basis for understanding and sustainably managing ocean and seabed resources. In order to meet the growing need for understanding the ocean and its sub-seafloor structures, it is essential to develop a comprehensive national strategy in marine geoscience, enhance collaboration at the local, regional, national, and international levels, and facilitate infrastructure and knowledge sharing. This town hall meeting aims to bring together Canadian marine geoscientists in all disciplines (geology, geochemistry and geophysics) and from all sectors (academic, government, industry) to commence planning for a Network of Centres of Excellence focused on studies of the Canadian seafloor. This effort will be facilitated through a recently funded Canadian initiative to construct and deploy a fleet of 120 state-of-the-art ocean bottom seismometers that will enable studies of the seafloor at unprecedented resolution, and spearhead targeted, multidisciplinary investigations of the Canadian offshore.*

**THE EARTH II**

**13:30 - 15:00**

**ROOM 204**

**EA39: In Memory of Kurt Kyser: Snapshots of Studies to Emphasize the Application of Isotope Geochemistry and Mineralogy to Earth Processes III. Sponsored by the Precambrian Division of the Geological Association of Canada**

**Organizers:** Kevin Ansdell, University of Saskatchewan; Mostafa Fayek, University of Manitoba  
**Chairs:** Kevin Ansdell; Mostafa Fayek; Adrienne Hanly, International Atomic Energy Agency

**13:30 - 1415 Remembering Kurt Kyser: The Many Gifts of Industry-Academia Collaboration**  
 James Marlatt - GeoTotal Group Ltd.

**13:45 - 1568 Uranium Minerals as Proxies for Global Tectonic Events**  
 Mostafa Fayek - University of Manitoba; Kurt Kyser - Queen’s University; Alfredo Camacho - University of Manitoba

**14:00 - 1901 Open-System Behavior of U-Th-Pa in Meta-Autunite: Measurement by LA-MC-ICP-MS**  
 Don Chipley - Queen’s University; Valeria Li - Brookfield Renewable; Alan Clark and Kurt Kyser - Queen’s University

**14:15 - 1886 Characterizing redox reactions in U-ore deposits using U, Mo and Tl isotopes**  
 Alexandre Voinot, Donald Chipley and Kurt Kyser - Queen’s University; Yulia Uvarova - CSIRO Mineral Resources; Matthew Leybourne and Daniel Layton-Matthews - Queen’s University

**14:30 - 1507 Partitioning of rare earth elements (REEs) between fluids and uraninite at 50-700°C**  
 Brandi Marie Shabaga - University of Manitoba; Alysha McNeil - University of Western Ontario; Mostafa Fayek - University of Manitoba; Robert Linnen - University of Western Ontario; Eric Potter - Geological Survey of Canada

**14:45 - 1373 Holistic basin analysis: evaluation of the potential of the Yeneena, Sibley and Sioux Basins to host unconformity-type uranium mineralization**  
 Adrienne Hanly - International Atomic Energy Agency



EA10:	<b>Global Plate Models: The State of the Art and Future Developments</b>
Organizers:	Bruce Eglington, University of Saskatchewan; Dave Evans, Yale University; Christopher Scotese, PALEOMAP Project (retired)
Chairs:	Bruce Eglington; Christopher Scotese
13:30 - 1561	<b>A Quantitative Comparison of Global Plate Tectonic Models: How are they similar? How are they different?</b> Christopher Robert Scotese - PALEOMAP Project
13:45 - 1822	<b>Plate tectonic modelling: How to go further?</b> Christian Verard - University of Geneva
14:00 - 1229	<b>A Plate Tectonic Framework in the Age of Digital Transformation</b> Jean-Christophe Wrobel-Daveau and Nilesh Vyavahare - Halliburton
14:15 - 2404	<b>GBDB, a potential open data platform for global plate tectonic modelling</b> Juanxuan Fan - Chinese Academy of Sciences
14:30 - 2029	<b>Lessons Learnt from Development of a Precambrian Plate Reconstruction Model</b> Bruce Melville Eglington - University of Saskatchewan; David Evans - Yale University; Sally Pehrsson - Geological Survey of Canada
14:45 - 2351	<b>A heterogeneous, ancient lithosphere – Constraints for more robust models</b> Graham Begg - Minerals Targeting International PL; William L. Griffin, Suzanne Y. O'Reilly and Lev Natapov - Macquarie University







TECHNICAL PROGRAM

# EDUCATION & KNOWLEDGE



EDUCATION &  
KNOWLEDGE

**EDUCATION AND KNOWLEDGE I 10:30 - 12:00 ROOM 208**

<b>EK17:</b>	<b>Bridging the Gap - Skills Training for Geoscience Graduates</b>
<b>Organizer and Chair:</b>	Kaylene Camuti, Australian Institute of Geoscientists Education Committee
<b>10:30 - 1498</b>	<b>Enhancing next generation geoscience curriculum: Project Integrate</b> William H. Hoyt, Lucinda Shellito, Steven Anderson, Byron Straw, Joe Elkins, Graham Baird and Julie Sexton - University of Northern Colorado
<b>10:45 - 1401</b>	<b>Establishing a Life-Long Learning Ethos to Address the New Geoscience Work Reality</b> Christopher Keane - American Geosciences Institute
<b>11:00 - 2243</b>	<b>Mapping the training requirements for professionals to sustain the mining industry</b> Nicole Tardif and Patricia Orozco - Laurentian University; Sue Bandaranaikie - James Cook University; Lesley Hymers - Mining Matters
<b>11:15 - 2331</b>	<b>The essential elements of professional practice standards in geoscience and the importance of acquisition of appropriate skills</b> Ruth Allington - GWP Consultants LLP, PERC, TG-GGP; Barbara Murphy - AIPG
<b>11:30 - 2232</b>	<b>Building an international network of raw materials training centres: The INTERMIN Project</b> Regueiro Y González-Barros and Luis Jorda - Spanish Geological Survey; Vitor Ramos Correia - European Federation of Geologists; Isabel Pino and Slavko Solar - EuroGeosurveys
<i>11:45</i>	<i>Panel Discussion</i>

**EDUCATION AND KNOWLEDGE II 10:30 - 12:00 ROOM 210**

<b>EK8:</b>	<b>Indigenous Knowledge and Perspectives in Education and Career Development</b>
<b>Organizer:</b>	Lesley Hymers, Mining Matters
<b>Chair:</b>	Glenn Nolan, Noront Resources
<b>10:30 - 2443</b>	<b>Water Keepers Journey</b> Stefanie Recollet and Cheryl Alissa Recollet - Wahnapiatae First Nation
<b>10:45 - 2444</b>	<b>Sharing for a Sustainable Future</b> Jolene Recollet and Cheryl Alissa Recollet - Wahnapiatae First Nation
<b>11:00 - 2473</b>	<b>Mining Matters Indigenous Communities Education and Outreach Programs</b> Lesley Hymers - Mining Matters
<b>11:15 - 2374</b>	<b>Developing and Engaging Indigenous workers for the Canadian Minerals Sector</b> Pascale Larouche - Mining Industry HR Council
<b>11:30 - 2188</b>	<b>From Hunter Gather to Industrial Workforce Participant: From Subsistence toward Prosperity</b> Glenn Nolan - Noront Resources; Maureen Hatherley - OLI SHOW
<i>11:45</i>	<i>Panel Discussion</i>

**EDUCATION AND KNOWLEDGE I 13:30 - 15:00 ROOM 208**

<b>EK15:</b>	<b>Mentorship and Transferring Knowledge to the Next Generation of Geoscientists and Geoscience Educators</b>
<b>Organizer:</b>	Lesley Hymers, Mining Matters
<b>Chairs:</b>	Hrayr Agnerian, Agnerian Consulting Ltd.; Lesley Hymers
<b>13:30 - 2066</b>	<b>Where do we go from here</b> Ken Robertson - SEG, APEGBC, EAGE



**MONDAY, JUNE 18**

13:45 - 2396 **Using a paired teaching model for transferring good practices in university education**  
Sarah Bean Sherman and Tara Holland - University of British Columbia

14:00 - 1044 **"Scientist Sue": A MENDELing Project to Teach Science**  
(MENDEL = MENToring + Role moDELing)  
Susan W. Kieffer - University of Illinois at Urbana-Champaign; Cyndy Woods - Rio Salado Community College

14:15 *Panel Discussion*

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**EDUCATION AND KNOWLEDGE II** **13:30 - 15:00** **ROOM 210**

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EK5: **Paleontological Collecting and Collections: Is There a Future for Fossils? Part I**  
Organizers: Melissa Grey, Joggins Fossil Cliffs; Jason Loxton, Cape Breton University; David Rudkin, Royal Ontario Museum; Graham Young, Manitoba Museum  
Chairs: Ann Timmermans, University of New Brunswick; Mike Wilson, Douglas College; Graham Young

13:30 - 2299 **KEYNOTE: Paleontological legislation and fossil collecting**  
John E. Storer

14:00 - 2317 **Museum collections as paleontological gold mines: New findings from old bones**  
Michael Clayton Wilson - Douglas College (retired)

14:15 - 2356 **Sixty Years of Citizen Science: Significant Dinosaur Trackways, Carboniferous Fish, Insects, and Footprints From Nova Scotia's Bay of Fundy**  
Tim J. Fedak - Nova Scotia Museum

14:30 - 2498 **Visiting lost worlds: using fossil collections for education and outreach. An example from the Quartermain Earth Science Centre**  
Ann C. Timmermans - University of New Brunswick

14:45 - 1974 **Stranded on a Tropical Shore: The William Lake Collections at the Manitoba Museum Form an Important Repository of Ordovician Biodiversity Data**  
Graham Young - Manitoba Museum; David Rudkin - Royal Ontario Museum; Edward Dobrzanski - Manitoba Museum; Michael Cuggy - University of Saskatchewan; Deborah Thompson - Manitoba Museum

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**EDUCATION AND KNOWLEDGE I** **15:30 - 17:00** **ROOM 208**

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EK18: **Transferring Geo-Knowledge to the Future and Beyond" Connecting Seasoned Experts with Early Career Generations**  
Organizers: Eduardo de Mulder and Courtney Jermyn, Earth Science Matters Foundation; Meng Wang, University of Chinese Academy of Sciences / World Young Earth Scientists (YES) Network  
Chairs: Eduardo de Mulder; Courtney Jermyn

15:30 - 2294 **The Cross-Generational Transfer of Geoscience Knowledge via Collaborative Efforts**  
Courtney Jermyn - Earth Science Matters Foundation

15:45 - 2164 **Bridging older and younger generations**  
Eduardo De Mulder - Earth Science Matters Foundation

16:00 - 1043 **Social Responsibility in Geoscience Education Workshop**  
Mike Katz - Mineral Development

16:15 - 1526 **Developing core skills in Australian geoscience graduates**  
Dale Sims and Carol Simpson - Carol Simpson and Associates

16:30 *Panel Discussion*



**EK5:** Paleontological Collecting and Collections: Is There a Future for Fossils? Part II  
**Organizers:** Melissa Grey, Joggins Fossil Cliffs; Jason Loxton, Cape Breton University; David Rudkin, Royal Ontario Museum; Graham Young, Manitoba Museum  
**Chairs:** Ann Timmermans, University of New Brunswick; Mike Wilson, Douglas College; Graham Young

**15:30 - 1852** **Bringing the old out for the new: The revival of UBC's Fossil Collection**  
 Kirsten FitzGerald Hodge - Pacific Museum of Earth

**15:45 - 1117** **Palaeontological Heritage Conservation: Developing scientifically informed for a global conservation policy**  
 Kevin Neil Page - Plymouth University

*16:00 Panel Discussion*



EDUCATION AND KNOWLEDGE I		08:30 - 10:00	ROOM 208
<b>EK3:</b>	<b>Geoheritage as a Societal Resource for Education, Environment, Culture and Tourism I</b>		
<b>Organizers:</b>	John Calder, Nova Scotia Department of Natural Resources; Godfrey Nowlan, Canadian National Committee for Geoparks; Kevin Page, Plymouth University; Patrick de Wever, Muséum National d'Histoire Naturelle, France		
<b>Chairs:</b>	John Calder; Tim Fedak, Fundy Geological Museum; Godfrey Nowlan; Kevin Page		
<b>08:30 - 1116</b>	<b>KEYNOTE: The International Commission on Geoheritage: Developing global geoheritage policy and sharing good practice</b>		
	Kevin Neil Page - Plymouth University; Lola Pereira - Universidad de Salamanca; Bjorn Schouenborg - CBI Betonginstituttet; Patrick de Wever - Muséum National Histoire Naturelle		
<b>09:00 - 1789</b>	<b>Collaborative Efforts to Promote Geoheritage in the U.S.</b>		
	Thomas Casadevall - U.S. Geological Survey; Marjorie Chan - University of Utah; Ester Sztain - National Academy of Sciences; David Mogk - Montana State University		
<b>09:15 - 1857</b>	<b>Geoconservation Monitoring Networks: Protecting the World's Oldest Complex Macrofossils at the Mistaken Point World Heritage Site</b>		
	Jack J. Matthews - Memorial University of Newfoundland		
<b>09:30 - 1876</b>	<b>The Montana Geoheritage Project</b>		
	David W. Mogk, David Lageson, David Bowen, Sarah Devaney, William Freimuth and Mariah Rapkoch - Montana State University		
<b>09:45 - 1804</b>	<b>Paleontological Resources for Educational Tourism to Geoheritage Sites: The Question of Critical Mass</b>		
	Rudi Hartmann - University of Colorado Denver		
EDUCATION AND KNOWLEDGE II		08:30 - 10:00	ROOM 210
<b>EK1:</b>	<b>Public Engagement in and Perception of Earth Science I</b>		
<b>Organizers:</b>	Lesley Hymers, Mining Matters; Aaron Johnson, American Institute of Professional Geologists		
<b>Chairs:</b>	Aaron Johnson; Beth McLarty Halfkenny, Carleton University		
<b>08:30 - 1705</b>	<b>The 100 Great Geosites Outreach Project: Engaging beyond the community and expanding the public's perception of geology</b>		
	Florence Bullough - The Geological Society		
<b>08:45 - 1834</b>	<b>Making Connections: Bringing the Legacy of Mining and Geology Back to the Community</b>		
	Leyla Weston - Yukon Geological Survey		
<b>09:00 - 2234</b>	<b>Arctic outreach: what are the challenges?</b>		
	Beth McLarty Halfkenny and Claudia Schröder-Adams - Carleton University		
<b>09:15 - 2388</b>	<b>Engaging the Public in Earth Science Through Partnerships</b>		
	Lesley Hymers - Mining Matters		
<b>09:30 - 1325</b>	<b>Empowering Geoscientists to Facilitate Face-to-Face Public Interactions</b>		
	R. Adam Blankenbicker, Edward Robeck and Celia Thomas - American Geosciences Institute		
<b>09:45 - 1482</b>	<b>Public perceptions of groundwater takings for bottled water in Ontario: a source of public pressure on policy makers</b>		
	Simon Gautrey - Wood PLC		



EDUCATION AND KNOWLEDGE I		10:30 - 12:00	ROOM 208
<b>EK3:</b>	<b>Geoheritage as a Societal Resource for Education, Environment, Culture and Tourism II</b>		
<b>Organizers:</b>	John Calder, Nova Scotia Department of Natural Resources; Godfrey Nowlan, Canadian National Committee for Geoparks; Kevin Page, Plymouth University; Patrick de Wever, Muséum National d'Histoire Naturelle, France		
<b>Chairs:</b>	John Calder; Tim Fedak, Fundy Geological Museum; Godfrey Nowlan; Kevin Page		
<b>10:30 - 1135</b>	<b>Geoheritage as a resource for sustainable economic development, tourism and public education in Canada</b> Godfrey S. Nowlan - Canadian National Committee for Geoparks		
<b>10:45 - 2355</b>	<b>The Cliffs of Fundy Aspiring Global Geopark, Enhancing International Geotourism for Nova Scotia's Bay of Fundy</b> Tim J. Fedak - Nova Scotia Museum; Gerald Gloade - Mi'kmawey Debert Cultural Centre; John Calder - Nova Scotia Department of Natural Resources; Stephanie Moreau - Municipality of Cumberland; Marlee Leslie - Cliffs of Fundy Aspiring Global Geopark		
<b>11:00 - 2496</b>	<b>From Experiential Tourism to Flying Drones: The Evolving Role of the Geological Survey in Geoheritage Projects, Newfoundland and Labrador</b> Alana Hinchey - Geological Survey of Newfoundland and Labrador		
<b>11:15 - 1552</b>	<b>Linking scientific research projects with geoheritage in an integrated, concurrent, multidisciplinary approach to large-scale research projects</b> Deanne van Rooyen - Cape Breton University		
<b>11:30 - 1600</b>	<b>Lousal mining site: an educational resource for future generations</b> Alvaro Madureira Pinto - Centro Ciência Viva do Lousal, Jorge Relvas - University of Lisbon; Margarida Oliveira, André Torres and Nuno Inácio - CCV Lousal; Carlos Fernandes - CMGJoao Matos - LNEG		
<b>11:45 - 1794</b>	<b>Expanding Support for the Geoheritage Initiative in Canada</b> John Allan Donaldson - Carleton University		

EDUCATION AND KNOWLEDGE II		10:30 - 12:00	ROOM 210
<b>EK1:</b>	<b>Public Engagement in and Perception of Earth Science II</b>		
<b>Organizers:</b>	Lesley Hymers, Mining Matters; Aaron Johnson, American Institute of Professional Geologists		
<b>Chairs:</b>	Aaron Johnson; Beth McLarty Halfkenny, Carleton University		
<b>10:30 - 1973</b>	<b>Public Perceptions of What Geoscientists Do – The Role of Professional Geoscience Organizations in Communicating What a Geologist Does</b> Barbara H. Murphy - American Institute of Professional Geologists and International Union of Geological Sciences (IUGS) Task Group on Global Geoscience Professionalism		
<b>10:45 - 1167</b>	<b>Does the public understand the role of geoscience in Modern Society? Lessons from Ireland</b> Aoife K. Braiden - Geological Survey Ireland and RML Ltd.; Siobhan Power and Koen Verbruggen - Geological Survey Ireland		
<b>11:00 - 2202</b>	<b>Disseminating objective science: an example from Canada's nuclear regulator</b> Julie L. Brown and Julie Meke - Canadian Nuclear Safety Commission		

11:15 *Panel Discussion*



<b>EDUCATION AND KNOWLEDGE I</b>		<b>13:30 - 15:00</b>	<b>ROOM 208</b>
<b>EK3:</b>	<b>Geoheritage as a Societal Resource for Education, Environment, Culture and Tourism III</b>		
<b>Organizers:</b>	John Calder, Nova Scotia Department of Natural Resources; Godfrey Nowlan, Canadian National Committee for Geoparks; Kevin Page, Plymouth University; Patrick de Wever, Muséum National d'Histoire Naturelle, France		
<b>Chairs:</b>	John Calder; Tim Fedak, Fundy Geological Museum; Godfrey Nowlan; Kevin Page		
<b>13:30 - 1710</b>	<b>Research on the innovation model of sustainable development of Geopark in China</b>		
	Jia Liu - China Geological Survey; Wei Gao - Talents Exchange & Services Center, State Grid Corporation; Yue Song, Yingchao Wang, Xiuqi Yin and Haixia Ye - China Geological Survey		
<b>13:45 - 1646</b>	<b>Can there be balance? Geoheritage for geotourism, considering economy and social justice in Barbuda and Puerto Rico</b>		
	Sophia Perdikaris - University of Nebraska; Rebecca Boger - Brooklyn College; Isabel Rivera-Collazo - University of California, San Diego		
<i>14:00</i>	<i>Panel Discussion</i>		

<b>EDUCATION AND KNOWLEDGE II</b>		<b>13:30 - 15:00</b>	<b>ROOM 210</b>
<b>Panel Discussion: The Changing World of Work I</b>			
<b>Organizer:</b>	Jennifer Wright, Mining Industry Human Resources Council (MIHR)		
	<i>We will explore the changing world of work in the mining industry, specifically discussing the reality of—and adaptation to—changing demographics; diversity and inclusion; educational requirements; and technological advances on the mining workforce. A particular focus will be on the ways employers are responding to the changes by engaging with tomorrow's workers at every stage of the talent pipeline. Background research will be presented and programs to address these issues will be discussed. This session is designed to delve into how the mining industry and its human resources can adapt to an evolving world to help responsibly develop our natural resources.</i>		
<b>13:30 - 2401</b>	<b>Labour Supply Opportunities and Challenges in the Canadian Mining Industry</b>		
	Jennifer Wright - MIHR		
<b>13:45 - 2403</b>	<b>The Value of Work Integrated Learning – A Case Study</b>		
	Jennifer Wright - MIHR		
<b>14:00 - 2400</b>	<b>Gender Equity in Mining: Addressing Systematic Barriers in the Workplace</b>		
	Jennifer Wright - MIHR		
<b>14:15 - 2399</b>	<b>Gearing Up – How Work Integrated Learning Can Help STEM-related Mining Labour Force</b>		
	Jennifer Wright - MIHR		
<b>14:30 - 2397</b>	<b>Broadening Engagement: Creating Employment Connections in Mining for Immigrants</b>		
	Jennifer Wright - MIHR		
<b>14:45 - 1066</b>	<b>Exploring Mineral Exploration: An HR Perspective</b>		
	Lindsay Coffin - MIHR		

<b>EDUCATION AND KNOWLEDGE I</b>		<b>15:30 - 17:00</b>	<b>ROOM 208</b>
<b>EK14:</b>	<b>Attracting Earth Science Educators</b>		
<b>Organizers:</b>	Kaylene Camuti, Australian Institute of Geoscientists (AIG) Education Committee; Lesley Hymers, Mining Matters		
<b>Chair:</b>	Wayne Spilsbury, Past-President AIG		

- 15:30 - 2416 **EdGEO Canada: Creating the next generation of geoscientists, one teacher workshop at a time**  
Beth McLarty Halfkenny - Carleton University; Janice Williams - EdGEO; Ann Timmermans - EdGEO, University of New Brunswick
- 15:45 - 2385 **Mining Matters' Teacher Training Programs: Professional Learning for Earth Science Teacher Development**  
Lesley Hymers - Mining Matters
- 16:00 - 1050 **Tell your 'My Geoscience Educator Story' as a resource for the next generation**  
Chris John Henry King - International Union of Geological Sciences (IUGS) Commission on Geoscience Education
- 16:15 - 1709 **The Teacher Earth Science Education Programme: A Professional Development programme for Teachers making a difference in the Australian classroom**  
Gregory Charles McNamara and Jill Stevens - Teacher Earth Science Education Programme; Kaylene Camuti - Lantana Exploration
- 16:30 *Panel Discussion*

**EDUCATION AND KNOWLEDGE II****15:30 - 17:00****ROOM 210****Panel Discussion: The Changing World of Work II**

**Organizer:** Jennifer Wright, Mining Industry Human Resources Council

*We will explore the changing world of work in the mining industry, specifically discussing the reality of—and adaptation to—changing demographics; diversity and inclusion; educational requirements; and technological advances on the mining workforce. A particular focus will be on the ways employers are responding to the changes by engaging with tomorrow's workers at every stage of the talent pipeline. Background research will be presented and programs to address these issues will be discussed. This session is designed to delve into how the mining industry and its human resources can adapt to an evolving world to help responsibly develop our natural resources.*





<b>EDUCATION AND KNOWLEDGE I</b>		<b>08:30 - 10:00</b>	<b>ROOM 208</b>
<b>EK2:</b>	<b>Speaking With One Voice - Geoscience Messaging in a Fragmented Community I</b>		
<b>Organizers:</b>	Sarina Cotroneo, University of Ottawa; Lesley Hymers, Mining Matters; Iain Samson, University of Windsor; Scott Swinden, Swinden Geoscience Consultants Ltd.		
<b>Chairs:</b>	Sarina Cotroneo; Iain Samson; Scott Swinden		
<b>08:30 - 1578</b>	<b>KEYNOTE: Scientists as Marketers: an organisational rethinking of science communication</b> Iain Stewart and Victoria Hurth - University of Plymouth		
<b>09:00 - 1074</b>	<b>The Flight of the Phoenix - Re-focusing the Canadian Federation of Earth Sciences and its Role in an Evolving Geoscience Community</b> Scott Swinden - Swinden Geoscience Consultants Ltd.; Sandra Barr - Acadia University		
<b>09:15 - 1331</b>	<b>Petroleum and the Environment: Geoscience as a Unifying Theme</b> Ben Mandler - American Geosciences Institute; Edith Allison - Consulting Geologist; Cassandra Rose - American Geosciences Institute; Maeve Boland - University College Dublin		
<b>09:30 - 1261</b>	<b>The American Geosciences Institute's Geoscience Policy program: representing the shared policy interests of 52 member societies</b> Maeve Boland, Anna Normand and Michelle Barreto - American Geosciences Institute;		

<b>EDUCATION AND KNOWLEDGE II</b>		<b>08:30 - 10:00</b>	<b>ROOM 210</b>
<b>EK10:</b>	<b>New Horizons in Earth Science Education Research</b>		
<b>Organizer:</b>	Lesley Hymers, Mining Matters		
<b>Chairs:</b>	Charly Bank, University of Toronto; Lesley Hymers		
<b>08:30 - 1783</b>	<b>Geoscience Education Specialists; Merging Geoscience and Educational Expertise to Enhance Future Learning About Earth and Its Resources</b> Francis Jones - University of British Columbia		
<b>08:45 - 2036</b>	<b>Sense of Place: Producing Environmentally and Culturally Aware Geoscience Graduates</b> Alison Jolley - University of British Columbia; Samuel Hampton - Frontiers Abroad; Ben Kennedy - University of Canterbury; Erik Brogt and Lyndon Fraser - University of Canterbury		
<b>09:00 - 2206</b>	<b>Geoscience Education Innovation for Future Generations: Using eBooks and Interactive Software to Enhance Student Learning</b> Jerusha Isabel Lederman and Mary-Helen Armour - York University		
<b>09:15 - 2241</b>	<b>Student Experience in Science General Education Online courses</b> Mary Helen Armour - McMaster University; Jerusha Lederman - York University		
<i>09:30</i>	<i>Panel Discussion</i>		

<b>EDUCATION AND KNOWLEDGE I</b>		<b>10:30 - 12:00</b>	<b>ROOM 208</b>
<b>EK2:</b>	<b>Speaking With One Voice - Geoscience Messaging in a Fragmented Community II</b>		
<b>Organizers:</b>	Sarina Cotroneo, University of Ottawa; Lesley Hymers, Mining Matters; Iain Samson, University of Windsor; Scott Swinden, Swinden Geoscience Consultants Ltd.		
<b>Chairs:</b>	Sarina Cotroneo; Iain Samson; Scott Swinden		
<b>10:30 - 1122</b>	<b>Geoscience and Canada - Understanding the Earth beneath our feet: How Canada's two national umbrella organizations developed a "single voice" booklet</b> Oliver J. Bonham - Geoscientists Canada; Hendrik Falck - Northwest Territories Geological Survey; Lesley Hymers - Mining Matters; Scott Swinden - Swinden Geoscience Consultants Ltd.; Kylie Williams - Resources Writer		



**WEDNESDAY, JUNE 20**

**10:45 - 1815** **Supporting Policy Directions: Breathing New Life into Science Communications**  
Donna Kirkwood - Natural Resources Canada

11:00 *Panel Discussion*

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**EDUCATION AND KNOWLEDGE II** **10:30 - 12:00** **ROOM 210**

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**EK13:** **STEM Education**

**Organizer:** Lesley Hymers, Mining Matters

**Chairs:** Charly Bank, University of Toronto; Lesley Hymers

**10:30 - 2431** **Girls in the Classroom - Unearthing Career Opportunities in Mining**  
Deb Shewfelt - RESPEC

**10:45 - 1069** **The IPGG/UNESCO – IGE0 international geoscience education survey**  
Chris John Henry King - International Union of Geological Sciences (IUGS) Commission on Geoscience Education

**11:00 - 2357** **Drawing STEAM, Developing Spatial Skills for Geoscience and Medicine**  
Tim J. Fedak - Nova Scotia Museum

11:15 *Panel Discussion*

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**EDUCATION AND KNOWLEDGE I** **13:30 - 15:00** **ROOM 208**

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**EK11:** **Expanding the Traditional Classroom: Innovative Tools for Transporting Students into the Field and Through Time I**

**Organizers:** Glenn Dolphin, University of Calgary; Lesley Hymers, Mining Matters; Derek Turner and Nathalie Vigouroux, Douglas College

**Chair:** Derek Turner

**13:30 - 1092** **The virtual field experience (VFE): Mitigating high enrolment and capacity issues**  
Glenn Dolphin, Alex Dutchak, Brandon Karchewski and Jonathan Cooper - University of Calgary

**13:45 - 1509** **International Geoscience Field Experience: Multidisciplinary Studies of The Earth in Context**  
Neil Banerjee - Western University

**14:00 - 1655** **Best practices and examples of using virtual reality in Earth and Environmental Sciences classrooms**  
Derek Turner - Douglas College

**14:15 - 2460** **A Virtual Geomorphology Field trip in an Introductory Geology Course**  
Brett Hollis Gilley, Brian Wilson and Neil Leveridge - University of British Columbia

**14:30 - 1952** **What does 4.56 billion years feel like?**  
Nancy Van Wagoner and Chris Kwiatowski - Thompson Rivers University

**14:45 - 1559** **Teaching Optical Mineralogy through Utilization of Digital Microscopy**  
Shaun David Graham - Carl Zeiss

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**EDUCATION AND KNOWLEDGE II** **13:30 - 15:00** **ROOM 210**

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**Panel Discussion: Diversity in Earth Science and Resource Careers I**

**Organizers:** Mona Forster; Libby Sharman, BHP; Kylie Williams, Resources Writer  
*Mining, forestry, and trades struggle to retain under-represented groups. Studies cite unconscious bias as a major barrier to female and minority employees. Blatant discrimination has all but disappeared, but subtle inequities remain. This session will include a convergence of diversity experts and initiatives to harness the momentum of existing enterprises and knowledge and make a real, lasting impact on the gender landscape in the Earth sciences and resource industry.*



EDUCATION AND KNOWLEDGE I		15:30 - 17:00	ROOM 208
EK11:	<b>Expanding the Traditional Classroom: Innovative Tools for Transporting Students into the Field and Through Time II</b>		
Organizers:	Glenn Dolphin, University of Calgary; Lesley Hymers, Mining Matters; Derek Turner and Nathalie Vigouroux, Douglas College		
Chair:	Derek Turner		
15:30 - 2285	<b>Stride Like a Velociraptor</b> Natalie Bursztyn and Rhyan Ibarra - California State University, Fullerton		
15:45 - 1235	<b>Teaching students about how geology “works” by teaching the historical development of geological concepts</b> Glenn Dolphin - University of Calgary		
16:00 - 2205	<b>Assessing the effectiveness of virtual reality in field skills training</b> Jacqueline Houghton and Clare Gordon - University of Leeds		
16:15 - 2063	<b>Students and instructors learning together beyond the traditional classroom</b> Carl-Georg Bank - University of Toronto; Anne Marie Ryan - Dalhousie University		
16:30	<i>Panel Discussion</i>		

EDUCATION AND KNOWLEDGE II		15:30 - 17:00	ROOM 210
<b>Panel Discussion: Diversity in Earth Science and Resource Careers II</b>			
<b>Organizers: Mona Forster; Libby Sharman, BHP; Kylie Williams, Resources Writer</b>			
<i>Mining, forestry, and trades struggle to retain under-represented groups. Studies cite unconscious bias as a major barrier to female and minority employees. Blatant discrimination has all but disappeared, but subtle inequities remain. This session will include a convergence of diversity experts and initiatives to harness the momentum of existing enterprises and knowledge and make a real, lasting impact on the gender landscape in the Earth sciences and resource industry.</i>			



EDUCATION AND KNOWLEDGE I		08:30 - 10:00	ROOM 208
EK12:	Ideas for Enhanced Earth Learning I		
Organizer:	Lesley Hymers, Mining Matters		
Chairs:	Chris King, International Union of Geological Sciences (IUGS) Commission on Geoscience Education; Eileen Van der Flier-Keller, Simon Fraser University		
08:30 - 1809	<b>Co-creation of an energy and resources education book with schoolchildren from a low STEM engagement area</b> Fergus McAuliffe - Irish Centre for Research in Applied Geosciences; Alex Boyd - University College Dublin		
08:45 - 1051	<b>Earthlearningidea – promoting deep questioning in lab and field</b> Chris John Henry King - International Union of Geological Sciences (IUGS) Commission on Geoscience Education; Peter Kennett and Elizabeth Devon - Earthlearningidea		
09:00 - 2387	<b>Mining Matters: supporting Earth Science and Mineral Resources Education in the classroom</b> Lesley Hymers - Mining Matters		
09:15 - 1047	<b>A free-to-download geoscience textbook for 16-year olds in your region?</b> Chris John Henry King - International Union of Geological Sciences (IUGS) Commission on Geoscience Education		
09:30 - 1604	<b>Contextualizing Earth Science Education</b> Erica Williams - Educator, retired		
09:45 - 1612	<b>Changing ideas in New Brunswick K-12 Earth Science education: combining trusted teaching approaches with tactile educational experiences through hands-on and project based learning</b> Ann C. Timmermans - University of New Brunswick		

EDUCATION AND KNOWLEDGE II		08:30 - 10:00	ROOM 210
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Panel Discussion: Professional Reliance – Navigating the Professional Aspect of your Career in Science I

Organizer: Lindsay Steele, Association of Professional Engineers and Geoscientists of BC  
*Most students and young scientists are focused on the nature of the work they are or will be doing, and the responsibility we as scientists have to society is often overlooked. Geoscientists, engineers and other scientists have a duty of care that is owed to the public and typically must be registered with the professional association in the area they are working within. Being registered as a professional is only one part of being accountable to the public, the bigger issue is how do we as scientists ensure that we are practicing at the high standards that society expects? This panel session will explore the perspectives of various individuals experienced in professional reliance and regulation and will include a Q&A session.*

EDUCATION AND KNOWLEDGE I		10:30 - 12:00	ROOM 208
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EK12: Ideas for Enhanced Earth Learning II  
 Organizer: Lesley Hymers, Mining Matters  
 Chairs: Chris King, International Union of Geological Sciences (IUGS) Commission on Geoscience Education; Eileen Van der Flier-Keller, Simon Fraser University

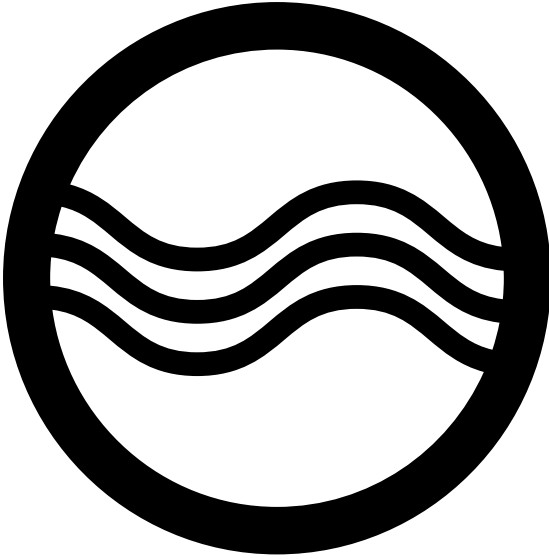
10:30 - 1318 **An International Model for Project-Based Energy Education**  
 R. Adam Blankenbicker, Edward Robeck and Mark Carpenter - American Geosciences Institute

10:45 - 2365 **Foundations: A new online cross-disciplinary STEAM educational resource and gateway to Geoscience**  
 Jeffrey James Packard - retired; Eileen Van der Flier-Keller - Simon Fraser University  
 Olive Okpara - Precise Web Marketing









TECHNICAL PROGRAM

# WATER



**WATER I** **10:30 - 12:00** **ROOM 206**

<b>WA11:</b>	<b>Environmental Impacts to Water by Resource Extraction I</b>
<b>Organizers and Chairs:</b>	Daniel Alessi, Sean Funk, Salman Safarimohsenabad and Konstantin von Gunten, University of Alberta
<b>10:30 - 1562</b>	<b>KEYNOTE: Comparison of source depths of fugitive gases from new, multi hydraulically fractured horizontal wells to old conventional, vertical wells in the WCSB</b> Karlis Muehlenbachs - University of Alberta
<b>11:00 - 1725</b>	<b>A methodology to assess 3D groundwater risk from hydraulic fracturing and other hydrocarbon activities</b> Sian E. Loveless, Melinda Lewis, John Bloomfield and Rob Ward - British Geological Survey Ian Davey and Alwyn Hart - Environment Agency
<b>11:15 - 1201</b>	<b>KEYNOTE: Subsurface Fugitive Gas in Groundwater: Recent Advances in Understanding from Controlled Release Investigations</b> Aaron Cahill - University of British Columbia
<b>11:45 - 1224</b>	<b>Membrane filtration and aeration approaches to treat hydraulic fracturing flowback and produced water</b> Isabel Plata and Daniel Alessi - University of Alberta

**WATER II** **10:30 - 12:00** **ROOM 207**

<b>WA4:</b>	<b>Groundwater and the Water-Energy-Food-Climate Nexus I</b>
<b>Organizers and Chairs:</b>	Diana Allen, Simon Fraser University; Jason Gurdak, San Francisco State University; Makoto Taniguchi, Research Institute for Humanity and Nature
<b>10:30 - 1138</b>	<b>Tradeoff and synergy of groundwater-energy-food nexus</b> Makoto Taniguchi - Research Institute for Humanity and Nature
<b>10:45 - 1877</b>	<b>Emerging Trends in Freshwater Availability as Viewed from Space: Implications for Water, Food and Human Security</b> James Famiglietti - Jet Propulsion Laboratory, California Institute of Technology
<b>11:00 - 1707</b>	<b>KEYNOTE: Opportunities and constraints for improved water resources management using different lenses and scales</b> Yoshihide Wada - International Institute for Applied Systems Analysis
<b>11:30 - 1588</b>	<b>Global Assessments of the Interactions between the Mining Industry and Water Resources</b> Stephen A. Northey - Monash University; Gavin Mudd - RMIT University; Nawshad Haque - Commonwealth Scientific and Industrial Research Organisation (CSIRO); Mohan Yellishetty - Monash University; Tim Werner - RMIT University
<b>11:45 - 1082</b>	<b>The water-energy-food nexus: identifying synergies and tradeoffs for sustainable groundwater management in a coastal aquifer, Pajaro Valley, CA, USA</b> Lauren Finkelstein, Jason J. Gurdak and Deandra Alvear - San Francisco State University



WATER I		13:30 - 15:00	ROOM 206
WA11: Organizers and Chairs:	<b>Environmental Impacts to Water by Resource Extraction II</b> Daniel Alessi, Sean Funk, Salman Safarimohsenabad and Konstantin von Gunten, University of Alberta		
13:30 - 1444	<b>KEYNOTE: Chemical and physical characterization of the shallow subsurface for assessing potential environmental impacts of shale gas development</b> Dirk Kirste and Diana Allen - Simon Fraser University		
14:00 - 1054	<b>Sorption behavior and toxicity of diphenyl phosphate: Implications for its environmental fate and potential impact to surface environments</b> Sean Funk - University of Alberta; Lisa Duffin, Craig McMullen, Nicholas Utting - CanmetENERGY, Natural Resources Canada; Yuhe He, Greg Goss and Daniel Alessi - University of Alberta		
14:15 - 2053	<b>KEYNOTE: Mitigation of environmental impacts through construction of a reclaimed upland-wetland system on soft tailings at an oil-sand mine, NE Alberta, Canada</b> Carl Mendoza, Max Lukenbach and Pam Twerdy - University of Alberta; Sean Carey - McMaster University; Kevin Devito and Simon Landhäusser - University of Alberta		
14:45 - 1491	<b>Controls on methane concentrations and fluxes within an oil sands end pit lake</b> Qingyang Liu, Sarah Rudderham and Daniel Francis - University of Saskatchewan; Greg Slater and Sean Carey - McMaster University; Lesley Warren - University of Toronto; Matthew Lindsay - University of Saskatchewan		
WATER II		13:30 - 15:00	ROOM 207
WA4: Organizers and Chairs:	<b>Groundwater and the Water-Energy-Food-Climate Nexus II</b> Diana Allen, Simon Fraser University; Jason Gurdak, San Francisco State University; Makoto Taniguchi, Research Institute for Humanity and Nature		
13:30 - 2433	<b>KEYNOTE: Estimating water usage for the US energy system: Suggestions for improving data collection and reporting</b> Rebecca Peer - University of Southern California; Emily Grubert - University of California Berkeley; Kelly Sanders - University of Southern California		
14:00 - 1643	<b>Groundwater depletion and climate change in the United States: future projections and impacts on irrigated agriculture</b> Sasmita Sahoo - Pennsylvania State University		
14:15 - 1823	<b>Impacts of climate variability and water use on water resources in the wet-dry tropics and strategies to adapt</b> Silja V. Hund, Laura Morillas and Douw G. Steyn - University of British Columbia; Diana M. Allen - Simon Fraser University; Mark S. Johnson - University of British Columbia		
14:30 - 1420	<b>Airborne Geophysics for Characterizing Aquifers with examples from Antarctica to Nebraska</b> Bill Peter Brown - SkyTEM Canada Inc.; Flemming Efferso - SkyTEM Surveys ApS		
14:45 - 1517	<b>Linking the Cryosphere with Regional Groundwater Dynamics in the Pacific Northwest: A Case Study in the Puyallup Basin, WA</b> Ravi Appana and Alexandra Richey - Washington State University		

**WATER I**

**15:30 - 17:00**

**ROOM 206**

**WA11:** **Environmental Impacts to Water by Resource Extraction III**  
**Organizers and Chairs:** Daniel Alessi, Sean Funk, Salman Safarimohsenabad and Konstantin von Gunten, University of Alberta

**15:30 - 1796** **KEYNOTE: Geochemical considerations for minimizing impacts of sulfide mine tailings on water resources**  
 Matthew Lindsay - University of Saskatchewan

**16:00 - 1062** **Geophysical and geochemical methods to determine and model the water flow from the waste rock piles – case study at Saattopora closed mine, Finland**  
 Raija Pietilä, Eija Hyvönen and Jouni Lerssi - Geological Survey of Finland

**16:15 - 2106** **KEYNOTE: Is there a risk of transition metal release into surface water during a accelerated weathering and carbonation of mined landscapes?**  
 Siobhan Wilson - University of Alberta; Jessica L. Hamilton - Monash University; Bree Morgan - University of Sydney; Connor C. Turvey - Monash University; Jenine McCutcheon - University of Leeds; David J. Paterson - Australian Synchrotron; Alastair W. Tait - Monash University; Gordon Southam - University of Queensland



<b>WATER I</b>	<b>08:30 - 10:00</b>	<b>ROOM 206</b>
<b>WA11:</b> <b>Organizers and Chairs:</b>	<b>Environmental Impacts to Water by Resource Extraction IV</b> Daniel Alessi, Sean Funk, Salman Safarimohsenabad and Konstantin von Gunten, University of Alberta	
<b>08:30 - 1358</b>	<b>Observing land and water footprints of transient small-scale mining using high resolution satellite images</b> Neil McIntyre and Celso Isidro - University of Queensland; Alex Lechner - Nottingham University; Ian Callow - University of Queensland	
<b>08:45 - 1179</b>	<b>Interaction index between extractive activity and groundwater resources - Application to the Boverie quarry (Rochefort, Belgium)</b> Alan Cotton and Louise Collier - University of Namur; Johan Barthélemy - University of Wollongong; Serge Brouyère - University of Liège; Timoteo Carletti - University of Namur; Pauline Collon - University of Lorraine; Vincent Hallet and Marie Moriamé - University of Namur; Philippe Orban - University of Liège; Annick Sartenaer - University of Namur	
<b>09:00 - 1349</b>	<b>The impacts of a major oil spill on phytoplankton as evidenced through the sedimentary records of dinoflagellate cysts in Prince William Sound, Alaska</b> Vera Pospelova and Maximilien Genest - University of Victoria; Joshua Williams - Virginia Institute of Marine Science; Tim Dellapenna - Texas A&M University; Kenneth Mertens - Ifremer, LER BO, Station de Biologie Marine; Steven Kuehl - Virginia Institute of Marine Science	
<b>09:15 - 1824</b>	<b>Climate Change and Sustainability of Potable Water Supplies in Coastal Areas: A Threatened Resource for Future Generations</b> Bruce E. Broster - University of New Brunswick	
<b>WATER I</b>	<b>10:30 - 12:00</b>	<b>ROOM 206</b>
<b>WA6:</b> <b>Organizers and Chairs:</b>	<b>Leadership in Water Sustainability</b> Michael Choi and Darcy Paslawski, Hemmera	
<b>10:30 - 2019</b>	<b>An assessment of ground water usage and potential groundwater licensing demand in the West Coast Region of BC</b> Tim Bennett - Hatfield Consultants	
<b>10:45 - 2056</b>	<b>Progress by Ontario's Groundwater Quantity Protection External Working Group on ways to share groundwater resources: identified issues</b> Simon Gautrey - Wood PLC	
<b>11:00 - 2127</b>	<b>Canadian Contributions to African University Hydrogeology Programs</b> Laurra Olmsted - UniWater Education Limited	
<b>11:15 - 1711</b>	<b>The groundwater maps produced by the Geological Survey of Ireland and how they support resource management decisions and policy</b> Monica Lee and Natalya Hunter-Williams - Geological Survey Ireland; Coran Kelly - Tobin Consulting Engineers	
<b>11:30 - 2259</b>	<b>Obtaining a social license for groundwater abstraction at Kurikka, Finland through the provision of open and accessible hydrogeological data and models</b> Holger Kessler - British Geological Survey; Niko Putkinen - Finnish Geological Survey; Ben Wood - British Geological Survey; Anna-Kaisa Pusa - City of Kurikka; Juha Kotiranta - Kurikka Vesihuolto Oy; Irma Hyry - Vaasan Vesi	

WATER II		10:30 - 12:00	ROOM 207
WA14:	<b>Hydrogeochemistry: Environment and Exploration I (AAG: 28th IAGS)</b>		
Organizers:	Stewart Hamilton, Ontario Government; Mathew Leybourne, Laurentian University; Peter Winterburn, University of British Columbia		
Chairs:	Patrice de Caritat, Geoscience Australia; Stewart Hamilton, Ontario Government; Sarah Hashimi and Elizabeth Priebe, Ontario Geological Survey		
10:30 - 2418	<b>KEYNOTE: Combining low-cost drilling and hydrogeochemistry to explore for Carlin-Type-Gold Deposits (CTGD's) in covered settings: A case study from the Kelly Creek Basin, Nevada</b> Wade Allan Hodges - Nevada Exploration Inc.		
11:00 - 2375	<b>Exploring undercover using 3D geochemistry: transitioning from basin-scale to prospect-scale Auexploration using hydrogeochemistry</b> James Buskard - Nevada Exploration Inc.		
11:15 - 1816	<b>Hydrogeochemical exploration of concealed PGE-bearing ultramafic rocks: A case study from the La Cabaña area in south-central Chile</b> Antonia Genot, Linda Daniele, Martin Reich and Fernando Barra - Universidad de Chile; José María González-Jiménez - Universidad de Granada; Javier Rivera - Universidad de Chile; Christian Antileo - Universidad de La Frontera		
11:30 - 1723	<b>Tellus Survey, Ireland: Regional surface water geochemistry as an exploration tool and environmental indicator</b> Vincent Gallagher, Katherine Knights, Ray Scanlon, Judith Mather, Mairead Glennon and Jim Hodgson - Geological Survey Ireland		
11:45 - 1372	<b>Hydrogeochemistry in Sediment-hosted Cu exploration: a case study from the Sentinel Deposit, NW Zambia</b> Amanda M. Stoltze - First Quantum Minerals Ltd.; Michelle Carey - Imdex Limited; James Kidder - Queen's University		
WATER I		13:30 - 15:00	ROOM 206
WA5:	<b>Groundwater and Surface Water Sustainability for People and the Environment: Science to Inform Water Management and Policy from Local to Global Scales I</b>		
Organizers:	Thomas Boerman and Tom Gleeson, University of Victoria; Ben Kerr, Foundry Spatial; Daniel Peters, Environment Canada and University of Victoria		
Chairs:	Tom Gleeson, University of Victoria; Ben Kerr, Foundry Spatial; Daniel Peters, Environment Canada and University of Victoria		
13:30 - 2002	<b>How much groundwater can we pump and protect environmental flows through time? Presumptive standards for conjunctive management of aquifers and rivers</b> Tom Gleeson - University of Victoria; Brian Richter - The Nature Conservancy		
13:45 - 1277	<b>Quantifying groundwater yield along a continuum for water management in southern Alberta</b> Jessica E. Liggett, Jeanette Klassen and Brian Smerdon - Alberta Geological Survey; Igor Pavlovskii and Makasi Hayashi - University of Calgary		
14:00 - 1434	<b>3D geological modelling supporting the management of UK's aquifers</b> Holger Kessler - British Geological Survey; Mark Whiteman and Alwyn Hart - Environment Agency England; Rob Ward - British Geological Survey		
14:15 - 2248	<b>Interest-Based Regional Groundwater Mapping in NE British Columbia: The Peace Project, Canada</b> Carlos Salas - Geoscience BC; Mel Best; Samantha E. Morgan and Diana M. Allen - Simon Fraser University		

- 14:30 - 1654** **Surface and groundwater dynamics of a small urban estuary and conservation area in Cape Town, South Africa: high frequency water level and salinity monitoring yields hydrological insights**  
 Ross Campbell - Independent Researcher; Hanief Ally - Independent Consultant; Gaathier Mahed - Nelson Mandela University; Elizabeth Day - Freshwater Consulting Group; Wageed Kamish - Tonkin + Taylor; Jacobus Retief - City of Cape Town

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**WATER II** **13:30 - 15:00** **ROOM 207**

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- WA14: Hydrogeochemistry: Environment and Exploration II (AAG: 28th IAGS)**  
**Organizers:** Stewart Hamilton, Ontario Government; Mathew Leybourne, Laurentian University; Peter Winterburn, University of British Columbia  
**Chairs:** Patrice de Caritat, Geoscience Australia; Stewart Hamilton, Ontario Government; Sarah Hashimi and Elizabeth Priebe, Ontario Geological Survey

- 13:30 - 1208** **KEYNOTE: Continental scale hydrogeochemistry: providing baselines for lithology mapping, health, agriculture and opening new areas for exploration**  
 Nathan Reid, David Gray and Robert Thorne - Commonwealth Scientific and Industrial Research Organisation (CSIRO)

- 14:00 - 2131** **Unravelling the fate of organic micropollutants in the subsurface using stable isotopes**  
 Daniel Hunkeler and Clara Torrento - University of Neuchâtel; Rani Bakkour - Swiss Federal Institute of Aquatic Science and Technology (EAWAG); Aileen Melsbach and Christina Lihl - Helmholtz Munich; Volker Prasuhn - Agroscope; Martin Elsner - Technical University Munich; Thomas Hofstetter - EAWAG; Violaine Ponsin - University of Neuchâtel

- 14:15 - 1932** **Hexavalent Chromium: Diffusion and Reaction in Fractured, Porous Sedimentary-Rock Aquifers**  
 Shuo Liang and Tom Al - University of Ottawa

- 14:30 - 1589** **Investigating the Geochemistry of Selenium in the Residual from Biologically Treated Mine-Impacted Waters**  
 Laura Volden, Dirk Kirste and Robert Gordon - Simon Fraser University; Mario Bianchin - Wood PLC

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**WATER I** **15:30 - 17:00** **ROOM 206**

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- WA5: Groundwater and Surface Water Sustainability for People and the Environment: Science to Inform Water Management and Policy from Local to Global Scales II**  
**Organizers:** Thomas Boerman and Tom Gleeson, University of Victoria; Ben Kerr, Foundry Spatial; Daniel Peters, Environment Canada and University of Victoria  
**Chairs:** Tom Gleeson, University of Victoria; Ben Kerr, Foundry Spatial; Daniel Peters, Environment Canada and University of Victoria

- 15:30 - 2459** **Eco-hydrological impacts of large wood emplacement in an incised stream**  
 Christopher Arthur Perra - Washington State Department of Ecology; Robert Granger - Washington Department of Fish and Wildlife; Tom Culhane - Washington State Department of Ecology; Scott Nikolai - Yakama Nation Fisheries; Jordan Harrington - BGC Engineering; Jonathan Kohr - Washington Department of Fish and Wildlife; Mitchell Long - Kittitas Conservation Trust

- 15:45 - 2018** **Streamflow Depletion Modeling: Methods for an Adaptable and Conjunctive Water Management Decision Support Tool**  
 Tom Gleeson and Xander Huggins - University of Victoria; Ben Kerr and Hailey Eckstrand - Foundry Spatial

- WA14: Hydrogeochemistry: Environment and Exploration III (AAG: 28th IAGS)**  
**Organizers:** Stewart Hamilton, Ontario Government; Mathew Leybourne, Laurentian University; Peter Winterburn, University of British Columbia
- Chairs:** Patrice de Caritat, Geoscience Australia; Stewart Hamilton, Ontario Government; Sarah Hashimi and Elizabeth Priebe, Ontario Geological Survey
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- 15:30 - 2407 KEYNOTE: Geochemical characterization leads to a fully-integrated conceptual model of groundwater flow systems, Wood Buffalo National Park, Canada**  
 Judit Déri-Takács, Carl Mendoza and Ben Rostron - University of Alberta
- 
- 16:00 - 2207 Hydrogeological Source Determination through Data Manipulation in Saskatchewan: a Regional Analysis of the Birdbear, Duperow, Souris River, and Dawson Bay Formations**  
 Kristl J. Tipton - University of Saskatchewan
- 
- 16:15 - 1775 Chemical and isotopic evidence of fragmented recharge areas and groundwater evolution in a glaciated, regional-scale carbonate groundwater system**  
 Elizabeth Priebe - Ontario Geological Survey; Shaun K. Frape - University of Waterloo; Richard E. Jackson - Geofirma Engineering Ltd.; David L. Rudolph - University of Waterloo; Abigail K. Burt - Ontario Geological Survey
- 
- 16:30 - 1231 Estimating hydrologic budgets of lakes in Parkland County, Alberta**  
 Katherine Nicole Snihur - University of Alberta; Julia Valentina Soares - University of British Columbia; Tingxian Zhang - University of Alberta; Shannon Flynn - Newcastle University; Alberto Reyes, Duane Froese and Daniel Alessi - University of Alberta
- 
- 16:45 - 1031 Rapid field hydrogeochemistry part I: reliability, methodology and sectors potential - lessons from southern BC 2011-2017**  
 Ron Yehia - MYAR Consulting; Ray E. Lett - Geochemist; Dave Heberlein - Heberlein Geoconsulting

<b>WATER I</b>		<b>08:30 - 10:00</b>	<b>ROOM 206</b>
<b>WA8:</b>	<b>Groundwater and Unconventional Oil and Gas Resource Development I</b>		
<b>Organizers:</b>	Aaron Cahill, University of British Columbia; Carlos Salas and Richard Truman, Geoscience BC; Laurie Welch, BC Oil and Gas Commission		
<b>Chairs:</b>	Aaron Cahill; Laurie Welch		
<b>08:30 - 1200</b>	<b>Hydrogeology of northeastern BC, Canada in the Context of Risks Posed to Groundwater Resources by Energy Resource Development Derived Fugitive Gas</b> Jessie Chao, Aaron Cahill and Roger Beckie - University of British Columbia		
<b>08:45 - 1262</b>	<b>Mapping recharge potential in west-central Alberta to understand aquifer susceptibility</b> Jeanette Klassen and Brian Smerdon - Alberta Geological Survey		
<b>09:00 - 2422</b>	<b>Informing research directions toward understanding risks of gas migration at oil and gas wells</b> Laurie Welch - BC Oil and Gas Commission; Aaron Cahill - University of British Columbia		
<b>09:15 - 2149</b>	<b>KEYNOTE: SCP Development and the Risk for Groundwater Contamination in Colorado and New Mexico</b> Greg Lackey, Harihar Rajaram and Devansh Chauhan - University of Colorado, Boulder; Owen Sherwood - Dalhousie University; Joseph Ryan - University of Colorado, Boulder		
<b>09:45 - 1148</b>	<b>Inorganic elements in formation and flowback waters - conceptual recovery of Ca, K, Mg, Br, I, B, and Li, British Columbia, Canada</b> George Jiri Simandl - BC Geological Survey; Carlee Akam, Michaela Yakimoski, David Richardson and Amy Teucher - BC Ministry of Energy, Mines and Petroleum Resources; Suzanne Paradis - Geological Survey of Canada; Sara McPhail, Fil Ferri and Yao Cui - BC Ministry of Energy, Mines and Petroleum Resources		
<b>WATER II</b>		<b>08:30 - 10:00</b>	<b>ROOM 207</b>
<b>WA15:</b>	<b>Innovations in Water Treatment and Water Quality</b>		
<b>Organizers and Chairs:</b>	Michael Choi and Darcy Paslawski, Hemmera		
<b>08:30 - 2475</b>	<b>Recognizing the True Value of Mine Water</b> Patrick Littlejohn - BQE Water		
<b>08:45 - 1056</b>	<b>Synthetic water calibration for water quality parameters &amp; water treatment program validation</b> Lynda Smithard and Cecilia Garcia Marra - McCue Engineering Contractors		
<b>09:00 - 1421</b>	<b>Magnetic organophilic clay: A reusable sorbent to remediate polycyclic aromatic hydrocarbon leaching waste</b> Salman Safari - University of Alberta		
<b>09:15 - 1381</b>	<b>Eco-social Sustainability Assessment of Groundwater Resources in Hanoi, Vietnam</b> Nuong Thi Bui, Akira Kawamura and Hideo Amaguchi - Tokyo Metropolitan University Duong-Du Bui - National Center for Water Resources Planning and Investigation Ngoc-Tu Truong - East China University of Science and Technology Hoang-Nam Nguyen - National Economics University Thi-Ngoc Nguyen - Hanoi University of Natural Resources and Environment		

**WATER I** **10:30 - 12:00** **ROOM 206**

<b>WA8:</b>	<b>Groundwater and Unconventional Oil and Gas Resource Development II</b>
<b>Organizers:</b>	Aaron Cahill, University of British Columbia; Carlos Salas and Richard Truman, Geoscience BC; Laurie Welch, BC Oil and Gas Commission
<b>Chairs:</b>	Aaron Cahill; Laurie Welch
<b>10:30 - 1424</b>	<b>Monitoring Gas Migration in an Unsaturated Soil System during a Controlled Methane Injection Experiment in Northeastern British Columbia, Canada</b> Olenka Noelani Forde, Uli Mayer, Aaron Cahill and Roger Beckie - University of British Columbia
<b>10:45 - 2067</b>	<b>A multi-model approach to safely close the Medicine Hat – Alderson gas field in southeastern Alberta</b> Tony Lemay, Amandeep Singh and Kevin Parks – Alberta Geological Survey Ane Wiersma - Deltares
<b>11:00 - 1808</b>	<b>Natural analogues for deep crustal fluid and gas movement in shale gas units of NE BC</b> Stephen Grasby - Geological Survey of Canada; Grant Ferguson - University of Saskatchewan
<b>11:15 - 2071</b>	<b>Simulating Wastewater Plume Migration in a Deep Geological Formation in Northeast British Columbia</b> Matthew Simons and Diana M. Allen - Simon Fraser University; Laurie A. Welch - BC Oil and Gas Commission; Dirk Kirste - Simon Fraser University

**WATER II** **10:30 - 12:00** **ROOM 207**

<b>WA16:</b>	<b>Mine Waste Management and Waste Site Remediation: Case Studies from Around the World I</b>
<b>Organizer and Chair:</b>	Ron Peterson, Queen's University
<b>10:30 - 1467</b>	<b>Using environmental risk assessment to manage contaminant risks during mine closure: Case studies</b> Beth Power - Azimuth Consulting Group
<b>10:45 - 1163</b>	<b>Best Practices and Ongoing Challenges for Characterization of Acid Rock Drainage Potential at Mine Sites</b> Madhumitha Raghav - Freeport-McMoRan; Sarah Doyle - Colorado School of Mines
<b>11:00 - 2480</b>	<b>The Pennask Deposit – A Case Study of Acid Rock Drainage Related to Civil Construction</b> Alexandra Jane McGladrey, Allison Laidlow and Julie Sandusky - BC Ministry of Transportation and Infrastructure

**WATER I** **13:30 - 15:00** **ROOM 206**

<b>WA9:</b>	<b>Modelling Integrated Surface-Subsurface Hydrologic Systems for Energy Resource Development and Regulation I</b>
<b>Organizers and Chairs:</b>	Steven Berg, Aquanty Inc.; Monireh Faramarzi, University of Alberta; Brian Smerdon, Alberta Geological Survey
<b>13:30 - 1310</b>	<b>KEYNOTE: Integrated 3D Surface-Subsurface Hydrosystem Modeling across Scales</b> Edward Sudicky, Steven Frey, Young-Jin Park, Hyoun-Tae Hwang, Michael Callaghan, Steven Berg, Andre Erler, Graham Stonebridge, Omar Khader, Alaba Boluwade and Xiaoyong Xu - Aquanty Inc.





14:00 - 1641	<b>Landform Design Influences Groundwater Recharge and Local-Scale Flow When Reestablishing Boreal Ecosystems on Soft Tailings Deposits</b> Maxwell C. Lukenbach, Carl Mendoza, Kevin Devito, Kelly Hokanson, Pamela Twerdy and Simon Landhäusser - University of Alberta; Sean Carey - McMaster University
14:15 - 2120	<b>KEYNOTE: Engineering scale integrated modelling within a watershed context</b> Dirk Kassenaar - Earthfx Inc.
14:45 - 2390	<b>Water Limitations on Coal-Fired Power Plants Planning in Asia with Climate Warming</b> Yaoping Wang - Ohio State University; Edward Byers and Simon Parkinson - International Institute for Applied Systems Analysis; Niko Wanders - Utrecht University; Jeffrey Bielicki - Ohio State University; Yoshihide Wada - International Institute for Applied Systems Analysis

**WATER II** **13:30 - 15:00** **ROOM 207**

WA16:	<b>Mine Waste Management and Waste Site Remediation: Case Studies from Around the World II</b>
Organizer and Chair:	Ron Peterson, Queen's University
13:30 - 1064	<b>Use of biochar in dry covers and landscaping solutions in mine waste areas</b> Raija Pietilä and Pertti Sarala - Geological Survey of Finland
13:45 - 1115	<b>Life at a permeable reactive barrier: metal contamination-induced changes in the microbial community</b> Konstantin von Gunten, Cheng Zhong, Samrat Alam, Luyu Zhang, Brendan Bishop, Karlis Muehlenbachs, Kurt Konhauser and Daniel Alessi - University of Alberta
14:00 - 2110	<b>Arsenic release kinetics from orpiment</b> Seyed Mohamad javad Mirazimi and Wenyong Liu - University of British Columbia

**WATER I** **15:30 - 17:00** **ROOM 206**

WA9:	<b>Modelling Integrated Surface-Subsurface Hydrologic Systems for Energy Resource Development and Regulation II</b>
Organizers and Chairs:	Steven Berg, Aquanty Inc.; Monireh Faramarzi, University of Alberta; Brian Smerdon, Alberta Geological Survey
15:30 - 1171	<b>KEYNOTE: Modelling hydrology for studying future water supply and adaptation in Alberta</b> Monireh Faramarzi - University of Alberta
16:00 - 1121	<b>The virtual water content of barley production in Alberta: implications for water use and yields to 2064</b> Mohammad Badrul Masud - University of Alberta; Marcos Cordeiro and Tim McAllister - Agriculture and Agri-Food Canada; Monireh Faramarzi - University of Alberta
16:15 - 1192	<b>Modelling the hydrology and water quality of the Elbow River watershed, Alberta, Canada</b> Danielle Loiselle, Monireh Faramarzi and Daniel Alessi - University of Alberta
16:30 - 1271	<b>Application of SWAT-MODFLOW Software to Evaluate Groundwater-Surface Water Interaction in West-Central Alberta</b> David Mathew Chunn, Daniel Alessi and Monireh Faramarzi - University of Alberta

WATER I		08:30 - 10:00	ROOM 206
WA13:	<b>Mining Water Policy and Stewardship in the Developing Context I</b>		
Organizers:	Jenny Broadhurst, University of Cape Town; Nadja Kunz, University of British Columbia; Imasiku Nyambe, University of Zambia		
Chairs:	Jenny Broadhurst; Nadja Kunz		
08:30 - 2506	<b>Mine water and water in mining: re-visioning to integrate mine, environment and community needs in water scarce regions</b> Susan Therese Harrison - University of Cape Town		
08:45 - 2126	<b>Research to Action to strengthen water resources management in Peru</b> Andre Xavier - Canadian International Resources and Development Institute; Bern Klein and Nadja Kunz - University of British Columbia		
09:00 - 2144	<b>Creating and sharing value in the early mine life-cycle: The case of Erdene Resource Development Corporation in Mongolia</b> Bulgan Batdorj, Jocelyn Fraser and Nadja Kunz - University of British Columbia		
09:15 - 2451	<b>Identification of Water and Energy Synergy and Trade-Off Potentials in the Peruvian Mining Industry</b> Lucia Chavez, Nadja Kunz and Bern Klein - University of British Columbia		
09:30 - 2089	<b>'Bringing water to the sea': desalinated water in mining regions of Chile</b> Cecilia Campero and Nadja Kunz - University of British Columbia		
09:45 - 1674	<b>The Contribution of Mining to Clean Water and Sanitation (SDG 6): Case Studies from South Africa</b> Jennifer L. Broadhurst - University of Cape Town		
WATER I		10:30 - 12:00	ROOM 206
WA13:	<b>Mining Water Policy and Stewardship in the Developing Context II</b>		
Organizers:	Jenny Broadhurst, University of Cape Town; Nadja Kunz, University of British Columbia; Imasiku Nyambe, University of Zambia		
Chairs:	Jenny Broadhurst; Nadja Kunz		
10:30 - 1359	<b>KEYNOTE: A proposed framework for supporting land and water use planning decisions in prospective mining regions of Colombia</b> Neil McIntyre - University of Queensland; Mario Fernando Angarita Vargas, Nicolas Fernandez Acosta, Luis Alejandro Camacho Botero, Jillian Pearse and Carme Huguet - Los Andes University; Oscar Jaime Restrepo Baena - Nacional University, Medellin; Juan Ossa Moreno and Diana Arbelaez-Ruiz - University of Queensland		
11:00 - 1548	<b>An assessment and comparison of water accounting tools for primary mineral beneficiation operations: A phosphate case study</b> Pieter De Waal Hugo, Olivia Venter, Edson Charikinya, Dee Bradshaw and Jennifer Broadhurst - University of Cape Town		
11:15 - 2135	<b>Geospatial Data Analysis as a tool to manage and communicate vulnerabilities and risks in the watersheds surrounding mining operations</b> Gabriel Castillo Devoto - University of British Columbia		
11:30 - 2122	<b>Participatory monitoring to strengthen water governance in mining regions of Latin America</b> Claudio Pareja, Jordi Honey-Roses and Nadja Kunz - University of British Columbia; Andre Xavier - Canadian International Resources and Development Institute; Jocelyn Fraser - University of British Columbia		
11:45 - 2113	<b>Promoting water data disclosure by mining companies in the South Gobi, Mongolia</b> Nadja C. Kunz - University of British Columbia; Arjun Bhalla and Enkhbileg Enkhjargal - International Finance Corporation		

# POSTERS

Follow the Trade show hours

## POSTERS

## THE EARTH

- 
- 1022 Enigmatic internal organ casts from Late Cretaceous to Neogene deposits of western North America: insights into paleobiology of terrestrial Annelida**  
Paul L. Broughton - Broughton and Associates
- 
- 1023 Joint sets and ghost-rock karstification of the Devonian limestone flooring the Athabasca Oil Sands, northeast Alberta**  
Paul L. Broughton - Broughton and Associates
- 
- 1046 Properties of rocks and mineral formations in West Africa**  
Ameche Emilianne Atem - University of Buea  
Folefac Atem - University of Texas Southwestern  
Christopher Agyingi - University of Buea
- 
- 1067 High-resolution topographic mapping around seafloor hydrothermal activity area by shipboard multi-beam echo sounder**  
Junji Kaneko and Takafumi Kasaya - Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
- 
- 1106 2D joint inversion based the gravity and seismic matching constraint**  
Zhaoxi Chen and Xiaohong Meng - China University of Geosciences, Beijing
- 
- 1119 The characteristics of satellite gravity and magnetic anomaly and its tectonic significance in sedimentary basin, West Africa**  
Xiaohong Meng, Nanping Wang and Shuling Li - China University of Geosciences, Beijing
- 
- 1130 Resolving high-grade metamorphic evolutions with U-Pb systematics: examples from Mesoproterozoic allochthons in the southern Scandinavian Caledonides**  
Fernando Corfu - University of Oslo
- 
- 1154 Geological mapping of coastal and offshore Japan (by GSJ, AIST): collecting and utilizing the geologic information**  
Kohsaku Arai and Ken Ikehara - Geological Survey of Japan
- 
- 1168 Challis-Kamloops Belt extensional magmatism: The Eocene Murray Dyke Swarm, Southern British Columbia, Canada**  
Anastasia Violet Oglloff and Derek Thorkelson - Simon Fraser University  
Jim Crowley - Boise State University
- 
- 1178 Crustal and uppermost mantle velocity structure and deformation in the Middle-Lower Yangtze River region and its tectonic implications**  
Hongyi Li, Longbin Ouyang and Xiaoyu Yang - China University of Geosciences, Beijing
- 
- 1246 Application of bi-dimensional empirical mode decomposition modeling for extracting gravity anomaly in the Luanchuan Mo Polymetallic District, China**  
Zhiqiang Zhang, Gongwen Wang and Gaoshen Tao - China University of Geosciences  
Zhenbo Ma - Henan Institute of Geological Survey
- 
- 1255 Generation and modification of apparently I-type granites as part of a giant S-type granite – an example from the Damara orogen (Namibia)**  
Lisa Schwark - RWTH Aachen University  
Stefan Jung - Universität Hamburg  
Folkmar Hauff - GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel  
Dieter Garbe-Schönberg - Christian-Albrechts-Universität Kiel  
Jasper Berndt - Universität Münster

- 1284 **Adakite occurrence in Cretaceous arc in Northeast Asia**  
Changeol Lee - Chonnam National University
- 1293 **Modelling of the stress tensor components and gravity anomalies caused by thermo-elastic deformations in the vicinity of magmatic bodies**  
Ladislav Brimich - Slovak Academy of Sciences
- 1302 **Deposit-scale temperature zonation at the San Sebastian Au-Ag deposit, Mexico from Raman spectroscopic analysis of graphitic carbon geothermometry**  
Justin Rumney, Sean Shieh and Robert Linnen - Western University
- 1416 **Geophysical reassessment of the role of ancient crustal structures on the development of the western Laurentian margin, Yukon and NWT, Canada**  
Nathan Hayward - Geological Survey of Canada  
Maurice Colpron - Yukon Geological Survey
- 1464 **Structural Framework for Carlin-type gold mineralization: Nadaleen trend, Yukon**  
Andrew Paul Steiner and Kenneth Hickey - University of British Columbia
- 1466 **The Coast - Insular Boundary Revisited: mid-Jurassic ductile deformation on Quadra Island**  
Sandra Johnstone - Vancouver Island University
- 1475 **Tin mineralization in the Erzgebirge/Krušné hory-Vogtland region (DE, CZ) – geology, Sn-ore types, metallogenic potential**  
Thomas Seifert - Technische Universität Bergakademie Freiberg
- 1515 **The exploration of metal mineral and oil and gas energy at large depth space**  
Chengcheng Sun, Xuan Feng, Jianyu Zhao, Qian Liu, Qingfa Meng and Xiaoqian Kang - Jilin University
- 1529 **Estimation of landslide susceptibility and probability of landslide recurrence based on annual landslide inventories in Taiwan**  
Chunhung Wu - Feng Chia University
- 1556 **HIM-SIMS - Nano-analytics for mineralogy studies with Secondary Ion Mass Spectrometry (SIMS) on the Helium Ion Microscope (HIM)**  
Shaun David Graham - Carl Zeiss
- 1575 **Structural Framework of the Cantung Tungsten Deposit, Northwest Territories**  
Ehsan Salmabadi and Kenneth Hickey - University of British Columbia  
Hendrik Falck - Northwest Territories Geological Survey
- 1611 **Early diagenesis of deep-sea sediments collected from an incoming plate in the Sunda Trench**  
Kiichiro Kawamura, and Kenta Mochizuki - Yamaguchi University  
Mebae Kuranaga - Yamaguchi University (presently Taiheiyo Consultant)
- 1613 **A linkage between parent materials of soil and potential risk of heavy metals in Yunnan province, China**  
Cheng Xiaomeng - Institute of Geophysical and Geochemical Exploration and UNESCO International Centre on Global-Scale Geochemistry
- 1615 **1:50000 land quality geochemical survey at a typical hilly-basin area in Zhejiang province**  
Ling He, Guohua Zhou and Binbin Sun - Institute of Geophysical and Geochemical Exploration
- 1647 **Mineral chemistry and isotopic systematics of carbonatites and related rocks from the Blue River area, east-central British Columbia**  
Alexei S. Rukhlov and Mao Mao - BC Geological Survey  
Jody Spence - University of Victoria  
Robert A. Creaser - University of Alberta  
Edith Czech and Janet Gabites - University of British Columbia

- 1649 A possible Early Cretaceous magmatic flow during collapse of thickened crust caused by the closure of Mongol-Okhotsk Ocean in East Mongolia**  
Lei Guo, Tao Wang and Ying Tong - Chinese Academy of Geological Sciences  
Enkh-Orshikh Orsoo and Narantsetseg Tserendash - Mongolian Academy of Sciences  
Lei Zhang - Chinese Academy of Geological Sciences
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- 1652 Gravity Monitoring at Cotopaxi Volcano, Ecuador: Challenges, Results, and Future Plans**  
Antonina Calahorrano-Di Patre and Glyn Williams-Jones - Simon Fraser University  
Maurizio Battaglia - U.S. Geological Survey and Sapienza University  
Mario Ruiz - Instituto Geofísico - EPN  
Jeffrey Witter - Simon Fraser University
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- 1672 Origins of crystal aggregates: insights from the nucleation mechanism of orthopyroxene**  
Matthew Ferguson and Alex Cherry - University of Tasmania
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- 1688 Trans-national Belgian-Dutch geological knowledge base on marine aggregates. From 3D voxel modelling to 4D cross-border environmental assessments**  
Vera R.M. Van Lancker, Lars Kint and Nathan Terseleer - Royal Belgian Institute of Natural Sciences  
Vasileios Hademenos - Ghent University  
Tine Missiaen - Flanders Marine Institute  
Robin De Mol and Guy De Tré - Ghent University  
Sytze van Heteren and Jan Stafleu - Geological Survey of the Netherlands  
Koen Degrendele and Marc Roche - Federal Public Service Economy
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- 1732 New insights into terrane boundary from whole-rock Nb/Ta geological mapping of Late Paleozoic felsic igneous rocks in the northern Alxa, NW China**  
Jianjun Zhang, Tao Wang, Lei Zhang, Ying Tong, Xingjun Shi and Lei Guo - Chinese Academy of Geological Sciences
- 
- 1737 Stable Isotopic Evidence for Major Surface Uplift Immediately Preceding High-Sulphidation Epithermal Gold Mineralization, Lagunas Norte, La Libertad, Peru**  
Allan Trevor Montgomery, Alan Clark and T. Kurtis Kyser - Queen's University
- 
- 1755 Hf isotopic characteristics of granitoids in the Chinese Altai-East Junggar region: Implications for the architecture of continental crust**  
Peng Song, Chinese Academy of Geological Sciences and China University of Geosciences, Beijing
- 
- 1784 Re-analysis of LITHOPROBE SNORCLE Corridor 2 magnetotelluric responses for imaging northern Cordillera tectonic structures**  
Banafsheh Habibi Dehkordi - University of Tehran  
Ian Ferguson - University of Manitoba  
Alan Jones - Complete MT solutions
- 
- 1829 A zircon U-Pb, Hf and O isotope investigation of the Karrat Group, Rae craton, west Greenland**  
Michael Vern McConnell and Camille Partin - University of Saskatchewan  
Richard Stern - University of Alberta
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- 1847 Mt Meager Volcanic Complex, BC - Towards a Comprehensive Geohazard Map**  
Rachel Warwick, Glyn Williams-Jones and Jeff Witter - Simon Fraser University  
Melanie Kelman - Natural Resources Canada
- 
- 1881 Application of geochemical and isotopic signatures to examine fluid flow in the Elk Point Basin, Canada**  
Aidan Mowat, Matthew B.J. Lindsay, Bruce M. Eglington and Grant A.G. Ferguson - University of Saskatchewan

- 1892 Mineral inclusions in diamonds from the Lace kimberlite, South Africa**  
Marina Karaevangelou and Maya G. Kopylova - University of British Columbia  
Paul Loudon - DiamondCorp
- 1904 Development of the Geomagnetic polarity time scale during Early Paleozoic: data and synthesis**  
Vladimir Pavlov - Russian Academy of Science  
Yves Gallet - Université Paris Diderot
- 1912 Extending the terrestrial depositional record of marine geohazards near Kitimat, coastal northwest British Columbia**  
David Huntley, Peter Bobrowsky and Gwyn Lintern - Geological Survey of Canada
- 1920 Burial rates of subducted continental crust from Lu-Hf garnet chronology on (ultra-)high pressure rocks; Western Gneiss Complex, Norway**  
Jamie Cutts and Matthijs Smit - University of British Columbia
- 1929 Mid-crustal tectonic lateral extrusion in the Southeastern Churchill Province; evidence from aeromagnetic survey, petrofabrics and geochronology**  
Marc-Antoine Vanier and Carl Guilmette - Université Laval  
Lyal Harris - Institut national de la recherche scientifique (INRS)  
Kyle Larson - University of British Columbia Okanagan  
Nathan Cleven and Antoine Godet - Université Laval  
Don Davis - University of Toronto  
Isabelle Lafrance - Ministère de l'Énergie et des Ressources naturelles (MERN)
- 2024 Short lived re-oxygenation during the global Cenomanian-Turonian Ocean Anoxic Event (OAE-2) as recorded by uranium isotopes**  
Brayden McDonald, Camille Partin and Chris Holmden - University of Saskatchewan  
Brad Sageman - Northwestern University
- 2039 Petrology and origin of the Paleoproterozoic Boundary Intrusions and associated brecciation in the Flin Flon area, Trans-Hudson Orogen, Canada**  
Nancy Normore and Kevin Ansdell - University of Saskatchewan
- 2049 Software and geodatabase design to facilitate compilation of attribute information for GIS geological maps**  
Hoang Anh Tu Nguyen and Bruce Eglington - University of Saskatchewan
- 2068 Constrained inversion of gravity and seismic data for determining depth to bedrock at a hydrological study site**  
Emmet Wisnicki, Carl-Georg Bank and Grant Ferris - University of Toronto
- 2087 Bonding Environment and Distribution of Arsenic and Selenium in Pyrite and Controls on Element Mobilization**  
Jocelyn Ross-Lindeman and Dirk Kirste - Simon Fraser University
- 2100 How to detect sub-seafloor hydrothermal ore deposits: effectiveness of marine electrical surveys**  
Tada-nori Goto - Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and Kyoto University  
Takafumi Kasaya and Hideaki Machiyama - JAMSTEC
- 2155 Reservoir characterization insight from lithofacies analysis within the reservoir of the Southern Outeniqua basin, South Africa**  
Monica Enifome Oghenekome - University of the Western Cape

- 2198 **Ghosts of apatites past: Using hyperspectral CL and micro-analyses to reveal multi-generational apatite in the Gifford Creek Carbonatite Complex, Western Australia**  
Paul Slezak and Carl Spandler - James Cook University
- 2211 **Geochemical and Mineralogical Assessment of Unconformity-Related Uranium Prospectivity of the Hawk Rapids Area, Southeastern Athabasca Basin, Canada**  
Philip A. Adene - University of Saskatchewan  
Steve Beyer and Kurt Kyser - Queen's University
- 2244 **Investigation of geotechnical drilling for the Evergreen Line LRT Tunnel confirms a record extending to at least MIS 4**  
Lionel Eric Jackson and Brent Ward - Simon Fraser University  
Derek Turner - Douglas College
- 2251 **Morphology of Cryogenian Stromatolites in the Aralka Formation, central Australia**  
Maija Raudsepp - University of Alberta  
Gordon Southam - University of Queensland  
Siobhan Wilson - University of Alberta  
Charles Verdel - Queensland University of Technology
- 2298 **The Reality of Axis Change**  
Mike P. Wetherley - Retired
- 2340 **Rare metal skarn mineralization in the Berggiesshuebel, Poehla and Oelsnitz districts / Erzgebirge-Vogtland (Germany)**  
Thomas Seifert, Tobias Petermann and Tilman Jeske - Technische Universität Bergakademie Freiberg
- 2341 **SEM-Cathodoluminescence Imaging and Analysis of Quartz Phenocrysts and Phenoclasts from Porphyritic Intrusions in the Yellowknife Greenstone Belt, NWT**  
Sarah Speight, David Lentz and Chris McFarlane - University of New Brunswick
- 2430 **Geology and tectonics of Admiralty Island, Alaska: foundation for a world-class Zn-Ag massive sulfide deposit**  
Susan M. Karl and Peter Haeussler - U.S. Geological Survey  
Glen Himmelberg - University of Missouri  
John Proffett - Geologic Consultant
- 2510 **Triassic alkaline magmatism and mineralization in the Xiong'er shan ore concentration area, East Qinling, China**  
Li Tang and Shou-Ting Zhang - China University of Geosciences, Beijing
- 2534 **Observations of the Mary River Group at Long Lake, northern Baffin Island, Nunavut: stratigraphy and structure of an Archean supracrustal sequence**  
Erin Bros - University of Alberta

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- 1019 The Northern Manitoba Mining Academy: providing resource-related training and support for research**  
Paul Alexandre - Brandon University
- 
- 1295 Doctoral Degree Program in Karstology**  
Martin Knez, Tanja Pipan and Tadej Slabe - Research Centre of the Slovenian Academy of Sciences and Arts, Karst Research Institute - University of Nova Gorica
- 
- 1368 Integrating Virtual Reality into mining education**  
Marius Braun, Lara A. Hauck, Lars Barnewold, Rudolf Suppes and Bernd G. Lottermoser - RWTH Aachen University
- 
- 1425 Connecting Geoscience Information and Decision Makers: AGI's Critical Issues Program**  
Cassandra Rose, Ben Mandler, Leila Gonzales and Maeve Boland - American Geosciences Institute
- 
- 1601 iGea Program: Supporting the training of engineers and scientists for sustainable development**  
Luisa Pinto Linconir, Maisa Rojas, Claudia MacLean, Danisa Peric, Eugenio Bravo, Felipe Célery and Felipe Díaz - University of Chile  
Raimundo Valenzuela - Covalente  
Sergio Celis - University of Chile
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- 1637 Virtual Field Trips (VFTs) as a tool for creating an immersive field experience for students with mobility issues**  
Nathalie Vigouroux and Derek Turner - Douglas College
- 
- 1858 Discovery Aspiring Geopark: A candidate for UNESCO Global Geopark from the Bonavista Peninsula of Newfoundland**  
Jack J. Matthews - Memorial University of Newfoundland
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- 2306 Increasing Undergraduate Authentic Science Pedagogy using Community Focused Videos**  
Tara Ivanochko, Michael Lipsen, Alison Jolley and Bradley Jackson - University of British Columbia (UBC)  
Michael Sider - UBC Studios
- 
- 2372 Linking an Interdisciplinary Field Project with Community Engagement: A Field Guide to the Geology of Kenna Cartwright Park, Kamloops, British Columbia**  
Nancy Van Wagoner, Ashley Vrieling, Jessie Thompson Gladish, Michael Garagan, Ben Grove, Logan Dafoe, Grant Sabraw, Ryan Parisien, Yula Saxon, Stacey Thom and Sam Riveras - Thompson Rivers University
- 
- 2458 Accessible Mt. St. Helens: The observer's perspective**  
Brett Hollis Gilley - University of British Columbia  
Jacqueline Houghton - University of Leeds
- 
- 2509 British Columbia's Fossil Heritage - from Fossil Management Framework to Tangible Outcomes in the Community**  
Elisabeth Deom - British Columbia Heritage Branch  
Marji Johns - Royal British Columbia Museum



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- 1072 Smart Hydropower 2 Supply Mining Operations with Sustainable Energy**  
Rudolf Suppes - RWTH Aachen University
- 
- 1367 Hybrid Energy Systems for Small-Scale Mining**  
Marius Braun and Bernd G. Lottermoser - RWTH Aachen University
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- 1590 Structural Analysis and Paragenesis of the Arrow Uranium Deposit, Athabasca Basin, SK: Controls on mineralization in the Patterson Lake corridor**  
Sean Hillacre and Kevin Ansdell - University of Saskatchewan  
Brian McEwan and Galen McNamara - NexGen Energy Ltd.
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- 1782 Data Integration, Exploring Decades of Data within the Athabasca Basin Uranium District**  
Gregory Bell, Kimberly Bradley, Craig Cutts and Ryan Desnoyers - AREVA Resources Canada Inc.
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- 1806 Structural heterogeneity, thermal spring distribution, and geothermal energy potential along the Southern Rocky Mountain Trench**  
Theron Finley, Martyn Unsworth, Stephen Johnston and Jonathan Banks - University of Alberta
- 
- 1865 Mapping the geothermal potential of a borehole heat exchanger in Kuujuaq, Québec, Canada**  
Nicolò Giordano - Institut national de la recherche scientifique (INRS)  
Simone Della Valentina - Politecnico of Torino  
Jessica Chicco - University of Torino  
Alessandro Casasso and Rajandrea Sethi - Politecnico of Torino  
Giuseppe Mandrone - University of Torino  
Jasmin Raymond - INRS
- 
- 1871 Radiation Induced Defects in Quartz Along the Sandstone-Basement Unconformity of the Athabasca Basin**  
Eli Wiens and Yuanming Pan - University of Saskatchewan  
Sean Bosman - Saskatchewan Geological Survey
- 
- 1947 Guarded hot plate, optical scanning, transient divided bar: comparison of steady-state and transient methods to assess rock thermal conductivity**  
Mafalda Miranda - Institut national de la recherche scientifique (INRS)  
Jessica Chicco - Unito  
Nicolò Giordano - INRS  
Giuseppe Mandrone - Unito  
Jasmin Raymond - INRS
- 
- 1965 Subduction dynamics: a first order control on the distribution of high-enthalpy geothermal systems (HEGRs)?**  
Vincent Marc Roche - ISTO  
Laurent Jolivet - Sorbonne Université  
Laurent Guillou-Frotier and Vincent Bouchot - French Geological Survey
- 
- 2027 Targeted Geoscience Initiative (TGI) Uranium Fluid Pathways Activity: Preliminary Geochronological and Isotopic Results**  
Jeremy Powell, Eric Potter and Victoria Tschirhart - Geological Survey of Canada  
Colin Card - Saskatchewan Geological Survey  
Dinu Pan - Alberta Geological Survey  
Ken Wheatley - Forum Uranium Corp.  
Cameron MacKay - Purepoint Uranium Group

- 2088 **D-Lactic Acid Microbial Production by *Serratia marcescens* MG113: Investigation of Fermentation Parameters and Fed-Batch Strategies**  
Ngoc-Tu Truong, Nuong-Thi Bui, Ben Rao, Fang-Min Bai and Ya-Ling Shen - East China University of Science and Technology
- 2239 **Taking the heat out of geothermal: integrating social licence with EGS in SW England**  
Iain Stewart and Hazel Gibson - University of Plymouth  
Peter Ledingham and Lucy Cotton - Geothermal Engineering Ltd.
- 2267 **Methane Emission of Shale Gas Extraction: A Literature Review**  
Tao Jin - China University of Geosciences, Wuhan
- 2316 **Electrical resistivity modelling of the fault-hosted Canoe Reach geothermal prospect, British Columbia**  
Benjamin Lee and Martyn Unsworth - University of Alberta
- 2474 **Boron Content and Isotopic Composition of Uraninite and U(VI) Alteration Minerals for Nuclear Forensics Applications**  
Tyler Louise Spano, Antonio Simonetti, Loretta Corcoran and Corinne Corinne Kuebler - University of Notre Dame
- 2504 **Genesis of Sinian Carbonate Nodules in Doushantuo Formation in the Ziqi Area, Yangtze craton: Significance for Ancient Gas Hydrate Formation**  
Song-bai Peng - China University of Geosciences, Wuhan  
Ming-zheng Zhang - China National Nuclear Corporation  
Li Zhang - China University of Geosciences, Wuhan  
Jia-song Fang - Shanghai Ocean University International Center for Marine Studies  
Xian-jin Zhang, Qing-sen Han, Timothy Kusky and Hong-tao Peng - China University of Geosciences, Wuhan

- 1018 Ore mineralogy of the Chisel Lake VMS deposit in the Flin Flon-Snow Lake Domain, Manitoba**  
Paul Alexandre - Brandon University  
Tom Heine - Retired  
Mostafa Fayek and Ryan Sharpe - University of Manitoba
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- 1038 Assessing the toxicity potential of mining SMS deposits associated with the Edmond vent field, Indian Ocean**  
Emily K. Fallon - University of Bristol  
Ulrich Schwarz-Schampera - Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)  
Richard Brooker - University of Bristol
- 
- 1088 Coupled substitution processes for trace element incorporation in sphalerite/wurtzite from Belgium and Germany**  
Henrike Franke and Torsten Graupner - Federal Institute for Geosciences and Natural Resources  
Sven Sindern - RWTH Aachen University  
Soeren Henning and Katja Pursche - Federal Institute for Geosciences and Natural Resources
- 
- 1093 Distinguishing between biogenic and volcanogenic mineralization in the metalliferous black shale Quock Formation, British Columbia, Canada**  
Hannah Rose Lang and John Thompson - Cornell University
- 
- 1098 Mineralogical and geochemical features of the Vorontsovsk Au-Hg-As(Tl) deposit (Northern Urals, Russia)**  
Ilya Vikentyev, Evgeniya Erastovna Tyukova and Olga Vikentyeva - Russian Academy of Sciences
- 
- 1100 Crust growth of Great Xing'an Range, Northeast China and its implications on gold deposit under deep cover**  
Pingping Zhu, Qiuming Cheng and Guoxiong Chen - China University of Geosciences
- 
- 1127 Platinum-group element mineral resources of Indonesia**  
Lara Amelie Hauck - Institute of Mineral Resources Engineering  
Bernd Georg Lottermoser - RWTH Aachen University  
Arifudin Idrus - Gadjah Mada University
- 
- 1140 Application of an improved mathematical morphological filter to edge detection of potential field data**  
Jianmin Zhang, Zhaofa Zeng, Xiaodong Sun and Xuegang Wang - Jilin University
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- 1156 Estimation of lithium resources and reserves in brines, Germany**  
Bernd Lottermoser - RWTH Aachen University
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- 1170 A time-efficient technique for measuring oxygen isotopes of aqueous samples**  
Nicolas Randazzo, Sang-Tae Kim and Martin Knyf - McMaster University
- 
- 1174 New instrumentation for high throughput carbon and oxygen isotope analysis of carbonate minerals**  
Shaun Barker, Ben Andrew, John Mering and Peter Jarman - University of Waikato  
Gregory Dipple - University of British Columbia  
Andreas Beinlich - Curtin University

- 1180 Geoenvironmental characteristics of indium-bearing mine wastes, Iberian Pyrite Belt**  
Bernd Lottermoser and Maria Wierzbicka-Wieczorek - RWTH Aachen University
- 1213 Transformation processes in Czech bentonites suitable for use in a deep geological repository**  
Irena Hanusová - Radioactive Waste Repository Authority SÚRAO
- 1214 Portable X-ray fluorescence (pXRF) analysis of critical elements in certified reference materials**  
Daniela Gallhofer and Bernd G. Lottermoser - RWTH Aachen University
- 1215 Evaluation of analytical capabilities of a portable X-ray fluorescence (pXRF) spectrometer for mineral exploration at Brandberg West Mine, Namibia**  
Philadelphia Mbingeneeko and Ansgar Wanke - University of Namibia
- 1216 Application of pXRF to exploration for Ga, Ge and In associated with sulphide deposits of the Otavi Mountainland, Namibia**  
Ester Shalimba and Ansgar Wanke - University of Namibia
- 1239 Rare-metal Mineralization in Al-Ghurayyah Alkaline Granite, the Arabian Shield**  
Abdullah A. Aseri and Robert Linnen - Western University
- 1252 New geochemical maps for Northern Norway**  
Belinda Flem, Ola A. Eggen and Clemens Reimann - Geological Survey of Norway
- 1265 Dissolved salt transport in soil cover materials for oil sands mine reclamation**  
Colton James Vessey, Carlo R.C. Cilia and Matthew B.J. Lindsay - University of Saskatchewan
- 1289 MLALookUP – a new software for geometallurgical and process-oriented analysis of MLA data**  
Natalia Krupko, Marius Kern and Edgar Schach - Helmholtz-Zentrum Dresden-Rossendorf (HZDR)  
Markus Buchmann - Technische Universität Bergakademie Freiberg  
Irina Bremerstein - UVR-FIA GmbH  
K. Gerald van den Boogaart - HZDR
- 1322 REE mineralization of the Ouro Fino Intrusive Suite, SW border of Amazonian Craton – Rondônia, Brazil**  
Tiago Buch - Brazilian Geological Survey  
Valmir da Silva Souza - Universidade de Brasília  
Carlos Eduardo de Mesquita Barros - Universidade Federal do Paraná  
Simon Goldmann - Bundesanstalt für Geowissenschaften und Rohstoffe
- 1332 Geological Links between Paleozoic Sediment-hosted Deposits of the Southeastern Canadian Cordillera**  
Suzanne Paradis - Geological Survey of Canada  
George J. Simandl - BC Geological Survey
- 1363 Provenance supply relationship of mantle magmatic activity to the Jinchuan copper nickel deposit**  
Jianyu Zhao, You Tian, Jincheng Ma, Chengcheng Sun and Xiaodan Li - Jilin University
- 1385 Genesis of the super large Spor Mountain, Utah, USA beryllium deposit: Timing and duration of dynamic magmatic-hydrothermal processes**  
Nora Foley, Robert Ayuso, Jorge Vazquez, Graham Lederer and Brian Jaskula - U.S. Geological Survey

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- 1392 Environmental Evaluation of the mining industry, proposal of a new method: Mining Environmental Impact Assessment Methodology (MEIAM)**  
Yao Kouadio Assemien François, David Salze and Lopez-Ferber Miguel - IMT Mines Ales  
Lasm Théophile and Yao Blaise Koffi - Université Félix Houphouët-Boigny  
Belcourt Olivier - IMT Mines Ales  
Ahoussi Kouassi Ernest - Université Félix Houphouët-Boigny
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- 1393 SHRIMP U-Pb Geochronology of Zircon and Opal, and Geochemistry of the World-class Volcanic-related Beryllium Deposit at Spor Mountain, Utah, USA**  
Robert Ayuso, Nora Foley, Jorge Vazquez, Graham Lederer and Brian Jaskula - U.S. Geological Survey
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- 1439 Field observations, mineralogy and geochemistry of Middle Devonian Ni-Zn-Mo-PGE hyper-enriched black shale deposits, Yukon**  
Jan Peter and Michael Gadd - Geological Survey of Canada
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- 1465 Assessment of the liberation, association, and reactivity of waste rock particles exposed to artificial weathering using an automated imaging system**  
Melanie St-Arnault - University of British Columbia  
Randy Blaskovich - Teck  
Bern Klein - University of British Columbia
- 
- 1497 Gold mineralization footprint in glacial sediments: geochemistry and indicator minerals from the Amaruq deposit (Nunavut, Canada)**  
Victor de Bronac de Vazelhes, Nicolas Boulianne-Verschelden and Georges Beaudoin - Université Laval  
Isabelle McMartin - Geological Survey of Canada  
Olivier Côté-Mantha and Marjorie Simard - Agnico Eagle Mines Ltd.
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- 1512 SBT and dynamics of gold mineralization and prospecting potential in SW Guizhou Province, China**  
Jianzhong Liu and Zepeng Wang - Guizhou Provincial Bureau of Geology and Mineral Exploration & Development  
Zenghua Li - University of Regina  
Songtao Li, Chengfu Yang, Junhai Li, Dafu Wang and Liangyi Xu - Guizhou Provincial Bureau of Geology and Mineral Exploration & Development  
Lulin Zheng - Guizhou University  
Niya Yang - Guizhou Provincial Bureau of Geology and Mineral Exploration & Development  
Weifang Song - Guizhou University

- 1514 Application of seismic illumination technology in deep metal mineral exploration**  
Jianyu Zhao, Xuan Feng, Chengcheng Sun, Enhedelihai Nilot, Minghe Zhang and Hailong Yu - Jilin University
- 1516 The application of geochemical data in geological mapping in 1: 50,000 geological and mineral surveys, northwestern China**  
Jingjing Gong, Jianzhou Yang and Shengming Ma - Chinese Academy of Geological Sciences
- 1537 Boron isotopes as a tool for the assessment of groundwater quality in the Mt. Vulture volcanic area (southern Italy)**  
Michele Paternoster, Filomena Canora, Ferdinando Deluca, Rosa Sinisi and Giovanni Mongelli - University of Basilicata
- 1538 Mineral exploration of Fe-Cu deposits in a Gobi-desert covered area, the eastern Tianshan mineral district, China**  
Jie Zhao - China University of Geosciences, Beijing  
Wenlei Wang - China Geological Survey  
Qiuming Cheng - China University of Geosciences, Beijing
- 1541 Zircons of the No. 782 granite complex from the Great Xing'an Range in NE China: Textural and chemical differences**  
Baofeng Tian, Mingqian Wu and Dehui Zhang - China University of Geosciences, Beijing
- 1563 Hydrothermal alteration and exploration vectors at the orogenic Island Gold deposit, Michipicoten greenstone belt, Wawa, Ontario**  
Tyler Ciuffo, Chris Yakymchuk, Shoufa Lin and Katia Jellicoe - University of Waterloo  
Patrick Mercier-Langevin - Geological Survey of Canada
- 1565 Petrogenesis and  $^{147}\text{Sm}$ - $^{143}\text{Nd}$  geochronology of scheelite at the Timmins West Mine, Ontario**  
Annika Van Kessel, Audrey Bouvier and Robert Linnen - Western University  
Zoltan Zajacz - University of Toronto  
Bastian Georg - Trent University
- 1584 Characteristics of host-rock diamicite matrix at the high-grade Kakula copper deposit (Democratic Republic of Congo)**  
Quinn Dabros and Elizabeth Turner - Laurentian University
- 1657 Genesis of the Nolans Bore fluorapatite REE deposit via carbonatite metasomatism revealed by REE and trace elements**  
Michael Anenburg, John Mavrogenes, Carolina Engel and Nolan Cechet - Australian National University
- 1671 Simulating sensor-based presorting with automated mineralogy data**  
Marius Kern - Helmholtz-Zentrum Dresden-Rossendorf (HZDR)  
Thomas Leissner - Technische Universität Bergakademie Freiberg  
Karl Gerald van den Boogaart and Jens Gutzmer - HZDR
- 1697 Unique ore deposits of the Northern Transbaikalia as a part of Paleoproterozoic Large Igneous Province**  
Bronislav Gongalskiy, Nadezda Krivolutsкая and Konstantin Murashev - Russian Academy of Sciences  
Georgiy Pavlovich - Moscow Geological Institute  
Alexander Timashkov - All Russia Geological Institute

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- 1717 Remobilization of the primary metallic concentration at the Hadal Awatib East Au-Cu (Zn-Ag) VMS deposit (Red Sea Hills, NE Sudan)**  
Julien Perret and Anne-Sylvie André-Mayer - Université de Lorraine  
Laurent Ciancaleoni and Remi Bosc - Arethuse Geology Sarl  
Chantal Peiffert - Université de Lorraine  
C. Tucker Barrie - CTBA Geoconsultants  
Nellie Falleau - Arethuse Geology Sarl
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- 1733 Discovering the next generation of porphyry Cu deposits in glaciated landscapes**  
Alain Plouffe - Geological Survey of Canada  
Christopher Kobylinski and Keiko Hattori - University of Ottawa  
Travis Ferbey - BC Geological Survey
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- 1735 Why we need the classification of anthropogenic resources: case study for heavy metal containing sludges**  
Soraya Heuss-Assbichler and Alexandra L. Huber - Ludwig-Maximilian Universität München
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- 1741 Platinum-bearing placers of the Siberian platform: paragenetic mineralogical associations, age of platinum minerals and possible link with LIPs**  
Alexander Okrugin and Olga Yakubovich - Russian Academy of Sciences  
Zhanna Druzhinina - Saint Petersburg State University  
Richard Ernst - Carleton University and Tomsk State University
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- 1743 Unusual rare-metal mineral assemblages formed by deuteric fluids in the marginal pegmatite of the Yichun Ta-Nb-Li deposit, SE China**  
Mingqian Wu - China University of Geosciences, Beijing  
Iain Samson - University of Windsor  
Dehui Zhang - China University of Geosciences, Beijing
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- 1765 Fluid Inclusion and Stable Isotope of the Awen Gold deposit in the Truong Son Orogenic belt, Lao PDR**  
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